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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1913.

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Errata.

Page 23, line 20 from bottom, *for Zeyher*, 15, 21 ! *read Zeyher*, 1521 !

Page 32, line 19 from top, *for abysinnica read abyssinica.*

Page 44, line 7 from top, *for* Bahtian (?) *read* Baktiari.

Page 128, line 15 from bottom, *for* Tita Shur *read* Tita Ghur.

Page 145, line 8 from bottom, *for* Franklyn *read* Franklin.

Page 257, line 5 from bottom, *for* Booth *read* Boott.

Page 278, line 8 from bottom, and page 311, line 3 from bottom, *for* Matthews *read* Mathews.

Page 317, lines 15 to 32 from top, *for* Houttyn *read* Houttuyn.

West Indian Acalyphas.

2242. 189. 808. 1125. 2. 13.

To face page 1.]

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

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No. 1.] [1913.

I.—NOTES ON SOME SPECIES OF ACALYPHA.

D. Prain and J. Hutchinson.

The earliest effort to enumerate the South African species of this genus we owe to Thunberg, in whose *Prodr. Pl. Cap.*, part 2, p. 117 (1800), we find diagnoses of three species: *A. glabrata*, *A. decumbens*, and *A. cordata*. In the edition of Thunberg's *Flora Capensis*, published by Schultes (1823), we find at p. 545 descriptions as well as diagnoses of the same three species, with diagnoses and descriptions of two others, *A. acuta*, Thunb., and *A. obtusa*, Thunb., on p. 546.

When, however, we turn to Thunberg's herbarium, which, thanks to the kindness of Professor Juel, has been entrusted to us for study, we find that of the two species of *Tragia* diagnosed in *Prodr. Pl. Cap.*, part 1, p. 14 (1794), and described in the *Flora Capensis*, ed. Schultes, p. 37 (1823): one, *T. villosa*, is an *Acalypha*. We find, moreover, that in Thunberg's herbarium, the plant which he collected between Sunday River and Fish River, and which he has written up as *A. glabrata* with his own hand, is not the plant to which the diagnosis and description published by Schultes apply. It is a plant with opposite leaves, and is in reality the plant described as "*A. acuta*." On the other hand, this name *A. acuta* is that which Thunberg has himself written on the sheet of the woody species with alternate leaves, which has been described as *A. glabrata*.

The opposite-leaved species described as *A. acuta*, happens to be an *Adenocline* and does not further concern us; the other species, *A. obtusa*, described on p. 546, is a *Leidesia*, and so may also be put aside. But the two remaining species described on p. 545 as

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A. decumbens, Thunb., and *A. cordata*, Thunb., respectively, prove, from Thunberg's original specimen, to be merely forms of one species: the specimens in the same collection further demonstrate that *Tragia villosa*, Thunb., is merely a variety of the same species. Jacquin, in 1760, had already published his *Acalypha villosa*, so that the publication of *Tragia villosa* in 1794 does not necessitate the abandonment of the name *Acalypha decumbens*, published in 1800. But before dealing with it himself Thunberg gave a specimen of this plant to Linnaeus as his n. 326 and without a name, some time after the appearance of the second *Mantissa* in 1771. When placing this specimen in his collection Linnaeus wrote it up as *Urtica africana*, "T. 326." The description did not, however, appear until 1781 when it was published by the younger Linnaeus, who, when publishing, altered his father's manuscript name "U. africana" to *U. capensis*, Linn. f. Suppl. Pl. 417. The name *A. decumbens*, which dates from 1800, must therefore give place to *A. capensis*.

Briefly summarised, Thunberg has made known two South African species of *Acalypha*: (1) *A. glabrata*, as conventionally understood, though this name was really applied by Thunberg to a member of another genus, and (2) *A. capensis*, which Thunberg broke up into three species, and referred to two different genera.

No further addition was made to our knowledge of this genus in Africa until the appearance in 1843 of Drège's *Zwei pflanzengeographische Documente*. At p. 161 of this work the following twenty-three references to Acalypha are given:—(1) A. betulina, *Retz* a; (2) A. betulina, *Retz* b; (3) A. betulina, *Retz* c; (4) A. betulina, *Retz?*; (5) A. glabrata, *Thunb.*; (6) A. languida, *E. Mey.* a; (7) A languida, *E. Mey.* b; (8) A. languida, *E. Mey.* c; (9) A. brachiata, α, *E. Mey.* a; (10) A. brachiata, α, *E. Mey.* b; (11) A. brachiata, β, *E. Mey.*; (12) A. cordata, *Thunb.*; (13) A. cordata, *Thunb.?*; (14) A. discolor, *E. Mey.*; (15) A. peduncularis, *E. Mey.* a; (16) A. peduncularis, *E. Mey.* aa; (17) A. peduncularis, *E. Mey.* b; (18) A. peduncularis, *E. Mey.?*; (19) A. velutina, *E. Mey.*; (20) Acalypha, 4636; (21) Acalypha, 5380; (22) Acalypha, 8240; (23) ?Acalypha, 4610.

Of these twenty-three references two are duplicates, because No. 13, A. cordata, *Thunb.?*, and No. 18, A. peduncularis, *E. Mey.?*, indicate the same species, as also do No. 3, A. betulina, *Retz*, c, and No. 23, Acalypha, 4610. The plant which is at once the subject of references 13 and 18, is neither *A. cordata* nor *A. peduncularis*; it is, however, the same as the subjects of the references 9, 10 and 11, *A. brachiata*, E. Mey., a distinct species different from either of those enumerated by Thunberg. To the same species belongs No. 12, "A. cordata," which, again, is not the species so named by Thunberg.

No. 5 of the list, "A. glabrata," is really A. glabrata, *Thunb.*, and to the same species belongs No. 4, "A. betulina?," which is not *A. betulina*, Retz (A. fruticosa, *Forsk.*), as also does *Acalypha*, 4636 (No. 20). The three gatherings named *A. betulina*, Retz (Nos. 1, 2 and 3), are shown by the specimens not to be that species, but to be forms or varieties of *A. glabrata*, usually with leaves broader than in the type; two of them, b and c, have glabrous

leaves, the remaining one, a, has velvety leaves, and is identical with No. 19, A. velutina, *E. Mey.*, which is therefore also referable to *A. glabrata*; the one marked b, however, includes some specimens which are not distinguishable from typical *A. glabrata*, Thunb.

To the second Thunbergian species belong 14, A. discolor, *E. Mey.*, and 22, *Acalypha*, 8240, both of which are *A. capensis*.

Of the remainder, Nos. 6, 7 and 8 represent a distinct species, *A. languida*; Nos. 15, 16 and 17, another distinct species, *A. pedunculuris*; while No. 21, *Acalypha*, 5380, represents yet another species for which, in Hb. Lübeck, Meyer proposed the name "A. longifolia."

Briefly summarised, we find then that Drège had repeated both of Thunberg's species :—

1. A. capensis, under references 14, 22, and
2. A. glabrata, *Thunb.*, under references 2 (in part), 4, 5, 20, 23, with the addition, as species, of two varieties of *A. glabrata*, viz. :—

   betulina, *E. Mey.*, *non Retz*, under references 2 (in part), 3, and

   velutina, *E. Mey.*, under references 1, 19.

But in addition to these two species Drège has added four more :—

3. A. languida, *E. Mey.*, under references 6, 7, 8.
4. A. brachiata, *E. Mey.*, under references 9, 10, 11, 12, 13.
5. A. peduncularis, *E. Mey.*, under references 15, 16, 17.
6. A longifolia, *E. Mey.*, under reference 21.

Unfortunately, these four species were not properly published in 1843, and the last of the list, *A. longifolia*, was not even named in Drège's *Zwei pflanzengeographische Documente*. Owing to this circumstance, although all the four species recognised by Meyer are valid, only one of his names has been maintained.

In 1845, Krauss published in *Flora*, vol. xxviii., on pp. 82–84, an account of the species of *Acalypha* which he had collected in South Africa. In dealing with his material he appears to have had the assistance of Buchinger, who named some of his specimens, and of Meisner and Hochstetter, who described some of the species.

It is somewhat singular that among the specimens collected by Krauss there should be no example of A. glabrata, *Thunb.* His n. 1826, however, which was dealt with by Hochstetter, who identified it with *A. discolor*, E. Mey., and provided a description of the species, is the original *A. decumbens*, Thunb., a fact which neither Hochstetter nor Krauss appears to have detected. His n. 1825 was named by Buchinger *A. Kraussiana*. This name was taken up by Meisner, who provided a description for the plant. In so doing, Meisner appears to have overlooked the fact that *A. Kraussiana* is identical with *Tragia villosa*, Thunb., and had no means of knowing that it is identical with *Urtica capensis*, Linn. f.

Krauss collected, as his Nos. 319 and 367, two plants, one near Durban, the other near Maritzburg, which, in spite of their identity as regards external appearance, he referred to different species. One of the two, n. 319, was taken to be *A. brachiata*, E. Mey.; the other, n. 367, it was supposed might perhaps be *A. languida* E. Mey. The two are conspecific; neither is *A. brachiata*, E. Mey.,

which as it happens Krauss does not appear to have collected at all; both, however, are *A. languida*, E. Mey. Owing to his doubt as to this fact, Hochstetter thought it desirable to use for n. 367 a new name, *A. petiolaris*; as this name is accompanied by a description, whereas the older name, *A. languida*, had none, *A. petiolaris*, Hochst., is the name which is now employed to distinguish this species.

Under his field number 377, Krauss appears to have collected three nearly related but fairly easily distinguishable forms. One of these Meisner identified—we believe rightly so, though so great an authority as Müller was of a contrary opinion—with A. peduncularis, *E. Mey.* Of the other two, Buchinger regarded one as a distinct species, *A. crassa*; Meisner described the other as a third distinct species, *A. punctata.* Krauss, however, has remarked in a footnote upon the difficulty which he experienced in separating *A. crassa*, Buching., from *A. peduncularis.* With the view of Krauss we entirely agree, and we concur with Müller in his treatment of the plant as a variety, var. *crassa*, of *A. peduncularis.* But as regards *A. punctata*, Meisn., which is only a form of the species already recognised by Meyer under the name *A. longifolia*, we concur with Krauss in treating it as distinct, and feel unable to follow Müller in dealing with it as only a variety of *A. peduncularis.*

The last species dealt with by Krauss is one represented by specimens which he had collected without any field-number; to this Buchinger gave the name *A. glandulifolia* and in spite of the fact that Müller treated this plant as yet another variety of *A. peduncularis* there is probably no more valid species in the genus.

Briefly summarised the account given by Krauss deals with only one of Thunberg's species of *Acalypha*, *A. capensis*, and omits *A. glabrata.* The account equally omits one of the species, *A. brachiata*, enumerated by Drège; of the other three it retains only the name given by Meyer to *A. peduncularis*; the name of *A. languida*, E. Mey., is altered to *A. petiolaris*, Hochst., that of *A. longifolia*, E. Mey., is replaced by *A. punctata*, Meisn. The omission of *A. brachiata*, E. Mey., is compensated for by the communication of the very distinct *A. glandulifolia*, Buching.

Up to this point (1845) the South African species of *Acalypha* were known to be *A. glabrata*, Thunb.; *A. capensis*; *A. petiolaris*, Hochst. (= *A. languida*, E. Mey.); *A. brachiata*, E. Mey.; *A. peduncularis*, E. Mey.; *A. punctata*, Meisn. (= A. longifolia, *E. Mey.*) and finally *A. glandulifolia*, Buching.

In *Linnaea*, vol. xx. (1847), p. 213 there is a list of specimens of *Acalypha* collected by Zeyher in South Africa. The first of these, Zeyher 3838, is named *A. peduncularis*, E. Mey., and the specimens show that this identification is correct. The second, Zeyher 3839, which is unnamed, became at a later date the type of a new species described by Baillon. The third, Zeyher 1518, also unnamed, became subsequently, in part, the basis of a new species described by Sonder. The next number in the list, Zeyher 1517, is applied to the specimens of three gatherings and is treated as including two species. One of these, represented by Zeyher 1517a, is identified with *A. glabrata*, Thunb., the other, represented by Zeyher 1517b and 1517c is provisionally identified with *A. betulina*,

Retz. This limitation is substantially in accordance with the limitation of the same two Acalyphas by Meyer in 1843; the plant identified with *A. glabrata*, Thunb. is in reality that species while the one identified as *A. betulina* is not the plant so named by Retz but is a variety of *A. glabrata*. The last *Acalypha* in this list, Zeyher 3840, identified correctly as *A. discolor*, E. Mey., is, therefore, as we have seen, *A. capensis* (= *A. decumbens*, Thunb.).

This Zeyherian list, briefly summarised, therefore adds to the genus two additional South African species neither of which is provided with a name.

The next contribution to our knowledge of the South African species of *Acalypha* was published by Sonder in Linnaea, vol. xxiii. (1850), pp. 115–117. Through the kindness of Professor Lindman and Dr. Dahlstedt we have been enabled, in considering this enumeration, to examine the actual specimens with which Sonder dealt. We may discuss the six species he accounts for seriatim.

The first species recorded by Sonder is "A peduncularis, E. Mey.! Meisn.! syn. A. crassa, Buching!" for which he cites no specimen but to which he adds a variety "β. glabrata, Sond." based on a specimen collected by Zeyher on the Macalisberg Range. The only specimen in his herbarium on which Sonder has written the name "*A. peduncularis*, E. Mey." is one of Zeyher 3838, from Howison's Poort, Albany Div., which is exactly like the plant collected in the Assegai Bush, Albany Div. by Drège, and obtained by the same collector on two occasions on the Zuureberg Range, that forms the basis of *A. peduncularis*, E. Mey. It so happens that Sonder's statement that this plant is really conspecific with the Natal one described by Meisner under the same name, is accurate. But an examination of his specimens shows that the accuracy of Sonder in this regard is purely accidental, for he did not have at his command any example of any portion of Krauss, 377. The specimen which led Sonder to this conclusion is one collected by Gueinzius at Port Natal which was written up in Sonder's collection as "Acalypha peduncularis, E. Mey.?—crassa, Buch.!" Above this legend has been added subsequently the name "A. punctata, Meisn.?," a justifiable afterthought because this plant of Gueinzius does not agree either with the part of Krauss 377 which Meisner described as *A. peduncularis*, or with the part of Krauss 377 which Buchinger named *A. crassa*. It is, however, identical with the remaining portion of Krauss 377, which is the type of *A. punctata*, Meisn.

Nor has Sonder been really more fortunate in his treatment of his own variety 'glabrata.' It is true that the description given by Sonder applies only to one plant, and that this plant is a specimen of Zeyher 1521, from the Macalisberg Range, on which Sonder has written the name *A. peduncularis*, β. *glabrata*. But in his own herbarium Sonder wrote up a specimen of Zeyher 3839 also as *A. peduncularis*, β *glabrata*; to this second specimen, which was collected on Van Staadensberg, Uitenhage Div., Sonder's description of var. *glabrata* is quite inapplicable.

Sonder's second species is one which he describes as new and is based on Gueinzius 171, from Natal and on Zeyher 1518, from the Macalisberg Range. This species, *A. angustata*, Sond., is perfectly

valid and the only modification that is required in his view consists of the inclusion of the proposed variety within the type.

Sonder's third species is *A. glandulifolia*, Buching., which we have already seen to be a valid species. Here again Sonder has suggested the recognition of two distinct forms; the advent of additional material indicates that this differentiation is not required.

The fourth species enumerated by Sonder is the one first issued by Drège in 1843 as *A. languida*, E. Mey., but first described by Hochstetter in 1845 as *A. petiolaris*. In giving preference to the synonym which, though the older, is merely a naked name, Sonder acted unfortunately.

The fifth species is that which Sonder has termed *A. betulina*, Retz. The species is now for the first time dealt with intelligibly and the true relationship of the two allied forms, whose existence had already been indicated by E. Meyer and by Ecklon and Zeyher, is more clearly defined. But the name employed is unfortunate; the species is not *A. betulina*, Retz, but is *A. glabrata*, Thunb. Fuller knowledge, moreover, indicates that there is no real necessity for the recognition of var. *latifolia* as apart from the type.

The sixth species, in spite of the doubt to which Sonder testifies, is really an *Acalypha* and is, as Sonder indicates, a distinct and valid species. But the use, in designating this new species, of the epithet which Sonder was aware Hochstetter had already applied to another *Acalypha* is singularly unfortunate. Our present conventions, which render incumbent the use of the name "A. petiolaris" in connection with the plant described as such by Hochstetter in 1845, prevent us from employing it to designate the plant so described by Sonder in 1850.

In Linnaea, vol. xxv. (1852), at p. 587, Scheele based on Drège, 8242, a species of *Acalypha* from South Africa, *A. lamiifolia*, Scheele. The plant on which this species was based is, however, identical with that to which Buchinger had already given the name *A. Kraussiana* and is hardly distinguishable from *Urtica capensis*, Linn. f. = *Tragia villosa*, Thunb., of which *A. decumbens*, Thunb. is at best only a variety.

Ten years later Baillon published in *Adansonia*, vol. iii. (1862), pp. 156–158 a resume of the South African species of *Acalypha*, based partly on specimens, partly on the literature which has been passed under review.

1. *Acalypha peduncularis*, Baill. is identical with *A. peduncularis*, E. Mey., the specimens of Masson and of Zeyher 3838 which are cited agreeing precisely with those of Drège on which the species was based. Baillon, however, had no opportunity of seeing any specimen of Krauss 377 and his erroneous reduction of *A. crassa*, Buching. to *A. peduncularis* is adopted from Sonder.

2. *Acalypha Zeyheri*, Baill., based on Zeyher 3839 and on a specimen of doubtful provenance bearing the number 301, supplies the earliest description of a valid species.

3. *Acalypha caperonioides*, Baill., based on Zeyher 1521 is again a valid species. In this instance Baillon has failed to note that the same plant is the type of *A. peduncularis*, β *glabrata*, Sond.

4. *Acalypha angustata*, Baill. is Sonder's species of this name.

5. *Acalypha glandulifolia*, Baill. is Buchinger's species of this name.

6. *Acalypha languida*, Baill. is E. Meyer's species of this name treated as it was treated by Sonder.

7. *Acalypha betulina*, Baill., to which Baillon only doubtfully refers Zeyher 1517a, the only specimen seen by him, is on this account *A. glabrata*, Thunb. proper.

8. *Acalypha discolor*, Baill. is *A. discolor*, E. Mey. treated as it was by Krauss and Hochstetter in 1845. To this Baillon has added a variety β major, *Baill.* which is, though Baillon was unaware of the fact, the same as *A. cordata*, Thunb.

9. *Acalypha lamiifolia*, Baill. is *A. lamiifolia*, Scheele, the identity of which with *A. Kraussiana*, Buching. Baillon has failed to notice. It is also almost identical with *Urtica capensis*, Linn. f. = *Tragia villosa*, Thunb., of which *A. decumbens*, Thunb., is only a variety.

10. *Acalypha brachiata*, Baill. is E. Meyer's species of this name.

11. *Acalypha Eckloni*, Baill., based on a gathering issued by E. Meyer as *A. cordata ?*, is identical with the preceding species. As the only description so far published was that here supplied by Baillon his name *A. Eckloni* supplants the earlier name *A. brachiata*.

Briefly summarised the resumé of Baillon of 1863 makes us aware of the existence of nine species, viz :—*A. glabrata* and *A. capensis* already known to Thunberg in 1800 ; *A. petiolaris*, *A. Eckloni* and *A. peduncularis* already known to E. Meyer (as A. languida, A. brachiata and A. peduncularis respectively) in 1843 ; *A. glandulifolia* already known to Krauss in 1845 ; *A. angustata* already known to Sonder in 1850 ; finally *A. Zeyheri* and *A. caperonioides* the existence of which had been indicated by Ecklon and Zeyher in 1847, now for the first time properly named and described. Baillon's resumé fails to account for *A. punctata*, Meisn. published by Krauss, or to observe that *A. lamiifolia*, Scheele is hardly more than a repetition of *A. Kraussiana*, Buching. also published by Krauss.

This resumé was followed in 1865 and 1866 by the preliminary and the finished monographs of the genus by Müller published in Linnaea, vol. xxxiv. (1865), pp. 1–54 and in De Candolle's Prodromus, vol. xv., pars ii. (1866), pp. 799–889 respectively. These two accounts we may conveniently consider together.

In the earlier account, Müller gives ten species as coming from South Africa. These are :—10, Sonderiana (Linnaea, vol. xxxiv., p. 9) ; 87, peduncularis (p. 28) ; 88, Zeyheri (p. 29) ; 89, petiolaris (p. 29) ; 90, languida (p. 29) ; 91, tenuis (p. 30) ; 92, Eckloni (p. 30) ; 98, glabrata (p. 36) ; 118, discolor (p. 38) ; 119, Kraussiana (p. 39).

In the fuller account of the following year, Müller enumerates eleven South African forms, adding two new species to the 1865 list and at the same time reducing two of those in the earlier list, *discolor* and *Kraussiana*, to the position of varieties of one species, *decumbens*. The 1866 list is as follows :—10, Sonderiana (DC. Prodr. xv., ii., p. 804) ; 59, grandidentata (p. 823) ; 116, peduncularis (p. 846) ; 117, Zeyheri (p. 847) ; 118, petiolaris (p. 847) ; 119, languida (p. 848) ; 120, tenuis (p. 848) ; 121, patens (p. 848) ; 122,

Eckloni (p. 849); 139, glabrata (p. 857), and 156, decumbens (p. 864). In addition to the foregoing, five of the species described by Müller in 1866, which were not at that time known to occur south of the Tropic, have since that date been gathered in South Africa. These are:—85, ornata (p. 833); 115, senensis (p. 845), from which 114, zambesica, is not distinguishable; 165, indica (p. 868); 175, ciliata (p. 873), and 183, segetalis (p. 877).

No remark is called for in the case of any of these five species, nor is any remark called for in the case of 10, Sonderiana, *Müll. Arg.* (1865), which is *A. petiolaris*, Sond. (1850), not of Hochst. (1845), and is a valid species.

Little remark is required in the case of 139, *glabrata*, Thunb. (1800), which is the plant described in Schultes' edition of Thunberg's *Flora Capensis* (1823), and on this account is a valid species notwithstanding the fact that it is not based on the specimen cited in that work, and is not the plant named *A. glabrata* in Thunberg's own herbarium. In his acceptance of the variety *latifolia*, Müller has merely followed Sonder. Another valid species is 156, *decumbens*, Thunb. (1800), now *A. capensis*, which is identical with *A. discolor*, E. Mey. ex Meisn. (1845), and includes *Urtica capensis*, Linn. f. (1781), *Tragia villosa*, Thunb. (1794), *A. cordata*, Thunb. (1800), *A. Kraussiana*, Buching. (1845), *A. lamiifolia*, Scheele (1852), and *A. discolor*, β *major*, Baill. (1862). But 59, *grandidentata*, Müll. Arg. (1866), is identical with *Tragia villosa*, Thunb., and therefore is not a valid species. Owing to Müller having failed to observe that *Urtica capensis*, Linn. f. (1781) and *Tragia villosa*, Thunb. (1794) are the same plant, he has omitted to employ for the species as a whole the name "Acalypha capensis." Another valid species is 122, *Eckloni*, Baill. (1863), which includes *A. brachiata*, E. Mey. In 1862 Baillon had himself actually accepted this name which Meyer had proposed in 1843. But in so doing, Baillon, like Meyer himself, failed to prepare a description; as a consequence, the conventions of nomenclature insist that the name *A. Eckloni*, though the accident of a misconception, shall be used for Meyer's plant.

Another quite valid species is 118, *petiolaris*, Hochst. (1845), the name used for which similarly supplants the name *A. languida* proposed by Meyer two years earlier. In this instance, however, Müller has made an effort to maintain *A. languida*, E. Mey., as a species. His justification for this is the belief that a specimen in Herb. Berlin, which Meyer has written up as *A. languida*, differs specifically from the other specimens so named, and therefore from *A. petiolaris*, Hochst. This view cannot be sustained. There is no specimen in Herb. Berlin named *A. languida* by Meyer which differs in any important feature from *A. petiolaris*, Hochst. Therefore 119, *languida*, Müll. Arg. (1865) is not a valid species. The same remark is called for in the case of 120, *tenuis*, Müll. Arg. (1865), to which Müller has attributed two varieties which do not differ from each or from *A. petiolaris*, Hochst., by any tangible character.

In the case of 117, *Zeyheri*, Müller has deviated very considerably from the treatment accorded to that species by Baillon when he founded it in 1863. Baillon's original types were Zeyher,

3839, and a specimen of doubtful provenance bearing the number 301, which Müller has been able to assign to Krebs. This latter specimen Müller transfers to *A. peduncularis*, var. *psilogyne*, Müll. Arg. But Müller's modification of *A. Zeyheri* by no means ends here, for he treats *A. Zeyheri*, Baill. (1863) as merely a variety, var. *glabrata*, of an enlarged *A. Zeyheri*, Müll. Arg. (1864), the other variety of which, var. *pubescens*, is in intention identical with the original *A. peduncularis*, E. Mey. (1843). There is no clue in the earlier account given by Müller in *Linnaea*, vol. xxxiv., to the idea underlying this arrangement. Apparently as an afterthought, a character is added in the account given in the *Prodromus* which might have served to differentiate *A. Zeyheri*, Müll. Arg., hardly of Baill. from *A. peduncularis*, Müll. Arg., not of E. Mey and hardly of Meisn., had it been constant. This character is that in *A. Zeyheri*, as widened by Müller, the flowers are monoecious, whereas in *A. peduncularis* they are dioecious. It is true that in some, but by no means all, of the specimens actually included by Müller in his *A. Zeyheri*, var. *pubescens*, the flowers are monoecious. But there is not a single example of Zeyher, 3839, which is all that Müller has left in *A. Zeyheri*, var. *glabrata*, in which the flowers are monoecious. In his choice of the varietal name *glabrata* to designate Baillon's original *A. Zeyheri*, Müller has been singularly unfortunate. The name was selected under the impression that the plant in question is *A. peduncularis*, var. *glabrata*, Sond. We know, as Müller clearly also knew, that Sonder had without due consideration, written this name upon his example of Zeyher 3839, the gathering on which *A. Zeyheri*, Baill., was based. But this does not alter the fact that Sonder's description of *A. peduncularis*, var. *glabrata*, does not apply to this plant, or modify the circumstance that the plant on which Sonder's description of *A. peduncularis*, var *glabrata*, was based, was treated by Baillon as the basis of a distinct species, *A. caperonioides*, Baill., which Müller, in 1866, though not in 1865, has referred as a distinct variety to his *A. peduncularis*.

The same entanglement marks Müller's treatment of his *A. Zeyheri*, var. *pubescens*. The specimens collected by Masson, Krebs, and Ecklon and Zeyher, which Baillon refers to *A. peduncularis*, var. *genuina*, are identical with those collected by Drège, which are referred to *A. Zeyheri*, var. *pubescens*. The latter are by no means invariably monoecious, the former by no means invariably dioecious, and the idea that Meisner was in error when he identified with Meyer's plant so named a species from Natal which he described for Krauss as *A. peduncularis*, is without foundation. At the same time *A. Zeyheri*, Baill., remains a perfectly valid species, but one with which *A. peduncularis*, var. *glabrata*, Sond., is not synonymous.

If the treatment accorded by Müller to *A. Zeyheri*, Baill., leaves something to be desired, this is more markedly the case as regards the treatment of *A. peduncularis*. In this species, Müller has recognised as many as seven varieties :—(*α*) caperonioides ; (*β*) genuina ; (*γ*) psilogyne ; (*δ*) crassa ; (*ε*) punctata ; (*ζ*) glandulifolia ; (*η*) angustata. Of these *α*, caperonioides is a valid species, *A. caperonioides*, Baill. (1863), the earliest name for which, *A. peduncularis*, var. *glabrata*, Sond. (1850), Müller has transferred, as a

synonym, to *A. Zeyheri*, var. *glabrata*; β, genuina is identical with Müller's own *A. Zeyheri*, var. *pubescens*; γ, psilogyne is a mixture of two plants, one of which, Zeyher, 3838, is referable to *A. peduncularis* proper, the other, Krebs 301, to *A. Zeyheri*, var. *glabrata*; δ, crassa, is in reality a variety of *A. peduncularis*; ε, punctata is a valid species, *A. punctata*, Meisn. (1845); ζ, glandulifolia is another valid species, *A. glandulifolia*, Buching (1845); η, angustata is yet another valid species, *A. angustata*, Sond. (1850), though in this case Müller has confused with it another very distinct species, represented by Wahlberg's specimen, viz.:—*A. depressinervia*, K. Schum. (1900) = Ricinocarpus depressinervius, *O. Kuntze* (1893).

In the case of 121, *patens*, Müll. Arg. (1866), another and somewhat different misapprehension has arisen.

Müller based his description of this species on a plant in the Hornemann herbarium at Copenhagen, and he attributed the habitat to South Africa. We are greatly indebted to Dr. Ostenfeld for the loan of this specimen, which on examination proved to be very different from any other species of the genus known to occur at the Cape. Moreover, we are unaware that Hornemann ever visited or even received any collections from that region.

Pinned to the sheet is the following note written by Müller:—"Species Americanae inter 'Capitatae' non occurrunt ex hanc ob rem e Capite Bonae Spei potius quam ex Antillis provenientem censeo." On the back of the mounting paper is written "Cap. b. Sp. v. Ind. occid.", and it may be worth noting that the first half of this seems to be in a smaller and different handwriting from the other, although the "v." appears to have been penned by the same hand as the "Ind. occid."

On comparing the plant with West Indian specimens, it was found to be identical with *Acalypha chamaedrifolia*, var. β, *genuina*, Müll. Arg. The original of this is *Croton chamaedrifolius*, Lam.,* which again was founded on a West Indian plant described and well figured by Plumier† under the name *Croton foliis cordatis*.

It is probable that if Müller had examined his original specimen of *A. patens* more critically he would not have written the above note. He described the terminal spike as being entirely female and often congested like a head, with lateral bisexual ones produced from the axils of the upper leaves. In the type, however, we have found a short male spike at the top of each terminal inflorescence just as in the lateral ones, and exactly as in the West Indian plant figured by Plumier. On account of this misapprehension, Müller came to the conclusion that his plant must belong to a group which is characterized by having a terminal female spike and lateral more or less entirely male ones. As this group is entirely African, Müller had no hesitation in assuming that the habitat of this plant must be South African.

Further research showed that Hornemann had described a West Indian plant in his collection under the name *Acalypha adscendens*, and he indicated its affinity with *A. reptans*, Swartz, which is undoubtedly the same as the form of *A. chamaedrifolia* already mentioned. Müller in DC. Prodr., relying on Hornemann's

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* Encycl. vol. ii. p. 215 (1786).
† Plant. Amer. t. 172, fig. 2 (1757).

description, has actually reduced this species to his *A. chamaedrifolia*, and we have little doubt that in doing so he was really dealing with his own type of *A. patens*, for Hornemann's diagnosis agrees so well with this specimen that we have no hesitation in concluding that the descriptions of both authorities were based on the same specimen though Hornemann's specific name is not inscribed on the sheet.

It seemed therefore necessary to ascertain whether any other specimen bearing the name *A. adscendens*, Hornem., existed in the Hornemann collection or in the general herbarium at Copenhagen, and on enquiring of Dr. Ostenfeld he kindly replied as follows :—

"I have carefully looked over all our Acalyphas from the West Indies and also from other parts, but we have no specimen named *A. adscendens*, Hornem. ; there are several named '*A. reptans*' and '*A reptans ?*' by Hornemann, and it [his *A. adscendens*] may have been one of these, but I think it is more probable that it is the specimen upon which Müller has described his *A. patens*. I have also enquired for *A. adscendens* in the Garden, where it was cultivated in Hornemann's time, but it is not there, at least not so named . . . I think that your suggestion regarding the identity of *A. patens* and *A. adscendens* is right, and at any rate Müller's argument about the origin of his plant is not feasible, for we have here in Copenhagen many old plants from the West Indies, but very scanty collections from Africa."

Briefly summarized then we find that *Acalypha patens*, Müll. Arg., was collected in the West Indies, and not in South Africa as stated by Müller, that its description was drawn up from the type of *A. adscendens*, Hornemann, which is identical with *A. chamaedrifolia*, var. *genuina*.

Since Müller's account of *Acalypha* was published in 1866, there have been only two important contributions to our knowledge of the South African species of the genus. The first of these is that by O. Kuntze (*Rev. Gen. Pl.* vol iii, pars 2, pp. 291, 292), published in 1893 under *Ricinocarpus*, and we are indebted to the kindness of Dr. N. L. Britton, New York, for an opportunity of studying Kuntze's actual material. Here (p. 291) is given an account of a very distinct species *R. depressinervius*, O. Kuntze, changed later by K. Schumann to *A. depressinervia* ; also a diagnosis of a new form, *pilosior*, O. Kuntze, of *A. glabrata*, Thunb. Kuntze's specimens, however, show that *R. crenatus*, from Mozambique recorded on this page is not *Acalypha crenata*, Hochst., but is *A. glomerata*, Hutchinson.

On p. 292 are given diagnosis of two varieties of *A. peduncularis* ; one of these, var. *ovatifolius*, O. Kuntze, is the plant previously described as *A. crassa*, Buching. ; the other, var. *Radula*, O. Kuntze, appears to be a distinct species for which the new name *A. Wilmsii* has been suggested by Professor Pax. As the plant is very different from *A. Radula*, Baker, Dr. Pax's name has been here adopted. Kuntze's specimens, however, show that while *R. peduncularis*, var. *punctatus*, recorded on this page, is really *Acalypha punctata*, Meisn., the plant cited as *R. peduncularis*, var. *genuinus*, is not the original *A. peduncularis*, E. Mey., Meisn., but the same thing as his own var. *Radula* and therefore is *A. Wilmsii*. Kuntze's other African specific determinations are accurate.

The second contribution to be noticed is that by Pax in *Bull. Herb. Boiss.* vol. vi. pp. 733, 734, published in 1898. Here four forms are referred to, all of them as new. As a matter of fact, however, every one of them had already been accounted for They are :— A. glabrata, var. pilosa, *Pax* l.c. 733 = pilosior *O. Kuntze* (1893); A. Rehmanni, *Pax* l.c. 733 = A. senensis, *Klotzsch* (1862); A. Schinzii, *Pax* l.c. 734 = Ricinocarpus depressinervius, *O. Kuntze*, (1893); A. Schinzii, var. denticulata, *Pax* l.c. 734 = A. angustata, *Sond.* (1850). The only other contribution to be noted is that by Sim in *The Forests and Forest Flora of Cape Colony*, published in 1907 where (p. 318) a really intelligible account of *A. glabrata*, Thunb. is given.

The number of species known from South Africa is now twenty. In the list of these which follows we have in each case given a detailed account of the distribution in South Africa of the species concerned and in all those cases where a species has not already been dealt with by one of us in the *Flora of Tropical Africa* its synonymy is given in full. Of the twenty species here recognised the last nine, all of which have subsessile leaves, would probably have been included by Müller in *A. peduncularis*; as a matter of fact all of them save *A. entumenica*, Prain, and *A. Wilmsii*, Pax, here for the first time described, were so included by Müller. The nine species with subsessile leaves here recognised are, however, as easily discriminated and as distinct as the eleven which have petioled leaves.

Conspectus of the South African Species of Acalypha.

1. **Acalypha Sonderiana**, *Müll. Arg. in Linnaea* xxxiv. 9 (1865) *et in DC. Prodr.* xv. ii. 804 (1866). Arbor parva; spicae superne foemineae, inferne masculae.—*A. ? petiolaris*, Sond. in Linnaea xxiii. 117 (1850); Walp. Ann. iii. 367 (1852). *Ricinocarpus Sonderianus*, O. Kuntze, Rev. Gen. Pl. ii. 618 (1891).

Natal: near Durban, *Gueinzius*, 11! 510! *Gerrard*! *Gerrard & McKen*, 1625!

2. **Acalypha glabrata**, *Thunb. Prodr. Pl. Cap.* 117 (1800), *et in Flor. Cap. ed. Schult.* 545 (1823); *Spreng. Syst.* iii. 882 (1826); *E. Mey. in Drège Zwei Pfl. Documente*, 161 (1843); *Eckl. & Zeyh. in Flora*, xx. 213 (1847); *Sim in For. Fl. Cap. Col.* 318, t. 142, fig. 2 (1907). Folia glabra, nunquam ultra 4 cm. longa, 2–2·5 cm. lata.—*A. betulina* ?, E. Mey. l. c. (1843). *A. betulina*; Sond. in Linnaea, xxiii. 116 (1850); Baill. Adansonia, iii. 157 (1862); non Retz. *A. glabrata*, var. *genuina*, Müll. Arg. in Linnaea, xxxiv. 36 (1865) et in DC. Prodr. xv. ii. 857 (1866). *Ricinocarpus glabratus*, O. Kuntze, Rev. Gen. Pl. ii. 618 (1891). *R. glabratus*, var. *genuina*, O. Kuntze, l.c. iii. ii. 291 (1893).

Cape Colony: Uitenhage Div.; between the Kromme River and Uitenhage, *Zeyher*, 1517a partly! Addo, *Burke*! Enon, *Drège* 2332! near Uitenhage, *Thunberg*! *Prior*! Port Elizabeth Div.; Krakakamma Forest, *Ecklon & Zeyher*, 72 partly! *Ecklon* 1124! *Zeyher*, 1517a partly! Bathurst Div.; Port Alfred, 300 ft., *Schlechter*, 2692! *Potts*, 197! near the Kowie River, *Ecklon &*

Zeyher, 72 partly! Fort Beaufort Div.; near Fort Beaufort, 1000–2000 ft., *Ecklon & Zeyher*, 72 partly! at the foot of the Witbergen, between the Gariep and the Caledon River, *Ecklon and Zeyher*! East London Div.; East London, *Rattray*, 123! British Caffraria; without locality, *Cooper*, 228!

Transkei: Bashee River, *Drège* b (under *A. betulina*) partly! Kentani, 1000 ft., *Miss Pegler*, 874 partly!

Tembuland: Perie Forest, *Kuntze*!

Pondoland: Port St. John, at Isnuka, *Galpin*, 3484 partly! between the Umtata River and St. John's River, *Drège*, 4655!

Natal: Durban, 50 ft., *Schlechter*, 2931! *Rehmann*, 8976! Clairmont, *Engler*, 2518a! *Kuntze*!

Transvaal: Crocodile River, *Leendertz*, 716! Shilouvane, *Junod* 1100!

Forma **pilosior**, *O. Kuntze* (sub *Ricinocarpum*); folia persistenter pubescentia, nunquam ultra 4 cm. longa, 2–2·5 cm. lata.—*Ricinocarpus glabratus*, *a* (*genuinae*) forma *pilosior*, O. Kuntze, Rev. Gen. Pl. iii. ii. 291 (1893).

Cape Colony: Komgha Div.; Prospect Farm, 2100 ft., *Flanagan*, 409! near Kei River, 2000 ft., *Schlechter*, 6250!

Tembuland; Perie Forest, *Kuntze*!

This form only differs from typical *A. glabrata*, Thunb., in having persistently pubescent leaves.

Var. **latifolia**, *Müll. Arg. in Linnaea*, xxxiv. 36 (1865) *et in DC. Prodr.* xv. ii. 857 (1866). Folia primum secus nervos prope basin subtus parce pilosa, cito fere glabra, 5–8 cm. longa, 4–6·5 cm. lata.—*A. betulina*, E. Mey. in Drège Zwei Pfl. Documente, 161 (1843) pro parte maxima; Eckl. & Zeyh. in Linnaea xx. 213 (1847); nec Retz. *A betulina*, var. *latifolia*, Sond. in Linnaea xxiii. 117 (1850). *Ricinocarpus glabratus*, var. *latifolius*, O. Kuntze, Rev. Gen. Pl. iii. ii. 291 (1893).

Transvaal: Zoutspansberg, near Goldgedacht, 3700 ft., *Schlechter*, 4602 partly! Blaauwberg, *Schlechter*! Barberton, *Thorncroft*, 4328!

Cape Colony: Uitenhage Div.; Addo, 1000–2000 ft., *Zeyher*, 1517b! Zwartkops River, *Prior*! Alexandria Div.; banks of the Bushman River, *Zeyher*, 1517c! Bathurst Div.; Kasuga, *Mac Owan*, 715! Komgha Div.; Kei Bridge, 560 ft., *Rogers*, 4506! Kei River near Komgha, 600 ft., *Flanagan*, 2318!

Transkei: Bashee River, *Drège* b (under *A. betulina*) partly! Kentani, 1000 ft., *Miss Pegler*, 874 partly!

Pondoland: Port St. John, Isnuka, *Galpin*, 3484 partly!

Natal: near Durban, 150 ft., *Drège* c (under *A. betulina*)! 4593! 4610! *Gueinzius*, 476! *Gerrard & McKen*, 546! *Gerrard*, 82! *Rehmann*, 8977! *Wood*, 1715! *Scott Elliot*, 1691! *Wilms*, 2267! Clairmont, *Engler*, 2524,! *Kuntze*! Inanda, *Wood*, 404! 430! Friedenau, 1750 ft., *Rudatis*, 1166!

This variety, though vaguely indicated by E. Meyer and by Ecklon and Zeyher, and more definitely recognised both by Sonder and by Müller, and though here formally defined and segregated is probably not a valid one. It differs only as regards the size of the leaves from typical *A. glabrata*, Thunb., and not infrequently the two forms have been collected in the same locality and issued under the same

number. The first instance of this occurs in the case of Drège, whose "A. betulina b" from the Bashee River is a mixture of the two glabrous varieties. The second instance is hardly less instructive; Burke and Zeyher, collecting together at Addo in Uitenhage, have distributed one the typical, the other the broad-leaved variety of "A. glabrata." But the same experience has been met with by collectors so competent as Mr. Galpin and Miss Pegler, whose respective field-numbers 3484 and 874 cover the same "mixture" of what Sonder and Müller have supposed to be distinct varieties. It is unnecessary to suppose that collectors so careful as those cited must be in error; indeed there is nothing to show that the specimens which conform with the characters of Müller's two varieties have not been taken from the same bush. With very little trouble the two varieties might even be manufactured because in a considerable number of instances—specimens of Drège's "A. betulina b," of Wood 430, and of Gerrard 82 may be cited as examples—the leaves at the ends of the twigs are those of var. *latifolia*, those lower down on the twig are those of typical *A. glabrata*. Such specimens bear out the statement of Sim (For. Fl. Cap. Col. p. 318) who speaks of "growth made during drought having leaves 1 inch long or less, that made during rains having leaves 3 inches long." It is therefore not only possible but probable that Sonder's variety "latifolia" is merely a condition, not even a form, still less a true variety.

Var. **pilosa**, *Pax*. Folia persistenter pubescentia, 5–8 cm. longa, 4–6·5 cm. lata.—*A. velutina*, E. Mey. in Drège Zwei Pfl. Documente 161 (1843). *A. betulina*, E. Mey. l.c. (1843) partim et quoad Drège 4595 tantum. *A. glabrata*, var. *pilosa*, Pax in Bull. Herb. Boiss. vi. 733 (1898).

Transvaal: Zoutspansberg; near Goldgedacht, *Schlechter*, 4602 partly!

Cape Colony: Bathurst Div.; Fish River, near Trumpeter's Drift, *Drège*, a (under *A. betulina*)! 4595! Komgha Div.; Kei Bridge, 1800 ft. *Flanagan*, 1214!

Transkei: Bashee River, *Drège* (*A. velutina*)! Kentani, *Miss Pegler*, 606!

Natal: Inanda, *Wood*, 1241 (a transition form)! Tugela, Colenso, *Gerrard & McKen*, 1623! *Rehmann*, 7164!

The form named var. *pilosa* by Dr. Pax bears to the form termed var. *latifolia* by Sonder, Müller and Kuntze very much the relationship that the form named f. *pilosior* by Kuntze bears to typical *A. glabrata*. Some of the specimens, notably those issued by Mr. Medley Wood as 1241, and those distributed by Dr. Schlechter as 4602, are almost exactly intermediate between var. *latifolia* and *A. velutina*, E. Mey (= var. *pilosa*, Pax). It is therefore almost as doubtful whether it is worth while recognising a pubescent as apart from a glabrous variety of *A. glabrata* as it is to distinguish between a large-leaved and a small-leaved variety. There is, however, a certain advantage in recognising the variety proposed by Pax; there is none in recognising the variety proposed by Sonder. The abandonment of Sonder's variety admits of the union of Kuntze's form with Pax's variety and Kuntze's name, having priority, is the one which should be adopted.

The most natural treatment for this species would therefore appear to be to treat it as including but one variety in addition to the type, as follows :—

Acalypha glabrata, *Thunb. uti supra ; var.* latifoliam, *Müll. Arg. uti supra inclusam.*

β var. **pilosior** *Prain* ; *var.* pilosam, *Pax* (1898) *et formam* pilosiorem, *O. Kuntze* (1893) *uti supra includens.*

3. **Acalypha glomerata,** *Hutchinson* in Kew Bulletin, 1911, 229 (1911) et in Dyer Fl. Trop. Afr. vi. i. 902 (1912). *Ricinocarpus crenatus,* O. Kuntze, Rev. Gen. Pl. iii. 2, 291 (1893) ; nec id. ii, 617.

Lourenço Marques : Lourenço Marques, *Howard,* 5696 !

There is nothing to add to the account of this species given by one of us in the Flora of Tropical Africa except to record the fact that it extends beyond the tropic into South Africa.

4. **Acalypha ciliata,** *Forsk. Fl. Aegypt.-Arab.* 162 (1775); *Hutchinson in Dyer, Fl. Trop. Afr.* vi. i. 901 (1912).

Transvaal : Shilouvane, *Junod,* 1028 ! 2188 !

There is nothing to add to the account of this species given by one of us in the Flora of Tropical Africa except to record the fact that it extends beyond the tropic into South Africa.

5. **Acalypha indica,** *Linn. Sp. Pl.* ed. 1, 1003 (1753) ; *Hutchinson in Dyer Fl. Trop. Afr.* vi. i. 903.

Transvaal : Vaal River, *Burke* ! near Hausman's Kraal, 4400 ft., *Schlechter,* 4185 ! Avoca, near Barberton, 1900 ft., *Galpin,* 1237 ! Komati Poort, *Kirk,* 105 ! Shilouvane, *Junod,* 1321 ! 1615 !

Natal : Tugela, *Gerrard & McKen,* 1624 !

The synonymy and the distribution outside South Africa of this species has already been fully discussed by one of us in the Flora of Tropical Africa.

6. **Acalypha segetalis,** *Müll. Arg. in Journ. Bot.* ii. 336 (1864) ; *Hutchinson in Dyer, Fl. Trop. Afr.* vi. i. 904 (1912).

Transvaal : Waterberg ; Springbok Flats, *Sampson,* 4410 ! Shilouvane, *Junod,* 2346 !

Great Namaqualand : Rehoboth, *Fleck,* 170 !

Little Bushmanland : without locality, *Fleck,* 472a !

Lourenço Marques : Lourenço Marques, *Quintas,* 210 ! Matola, *Schlechter,* 11,686 ! Incanhini, *Schlechter,* 12,043 !

A species exceedingly closely allied to *A. indica,* Linn., the synonymy of which has been fully discussed by one of us in the Flora of Tropical Africa. The only addition which has to be made to that record is to note the fact that it extends southward beyond the tropic on the western as well as on the eastern side.

7. **Acalypha capensis,** *Prain.* Caules dense patenter pilosi ; folia basi saepissime cordata, subtus ubique dense pilosa ; spicae foemineae paucibracteatae in axillis supremis axillares.—*Urtica capensis,* Linn. f. Suppl. 417 (1781). *U. africana,* Linn. Mss. ex. Jackson, Ind. Linn. Herb. 148 (1912). *Tragia villosa,* Thunb. Prodr. Cap. 14 (1794) et in Flor. Cap. ed. Schult. 37 (1823) nequaquam *Acalypha villosa,* Jacq. *Acalypha Kraussiana,* Buching. ex Meisn. apud Krauss in Flora xxviii. 84 (1845) ; Müll. Arg. in Linnaea xxxiv.

39 (1865). *A. decumbens*, *a*, *villosa*, Müll. Arg. in DC. Prodr. xv. ii. 864 (1866) quoad spp. omnia. *A. cordata*, Burchell Mss. nec Thunb.

Cape Colony: George Div.; Outeniqua Mountains, *Thunberg*! *Rehmann*, 258! Knysna Div.; near Knysna, *Burchell*, 5390! 5391! *Krauss*, 1825! Wittedrift, Plettenbergs Bay, *Pappé*!

Forma **grandidentata.** Caules foliaque uti in forma praecedenti, sed spicae foemineae pluribracteatae terminales.—*A. grandidentata*, Müll. Arg. in DC. Prodr. xv. ii. 823 (1866).

Cape Colony: Knysna Div.; near Knysna, *Burchell*, 5392! without precise locality, *Mund & Maire*, 659!

Forma **decumbens.** Caules glabri; folia basi truncata vel parum cordata, subtus argillaceo-incana.—*A. decumbens*, Thunb. Prodr. Pl. Cap. 117 (1800) et in Flor. Cap. ed. Schult. 545 (1823); Spreng. Syst. iii. 882 (1826). *A. discolor*, E. Mey. in Drège Zwei Pfl. Documente, 161, nomen (1843) ex parte; Eckl. & Zeyh. in Linnaea xx. 213 (1847) ex parte; Baill. Adansonia iii. 157 (1862); Müll. Arg. in Linnaea, xxxiv. 38 (1865) ex parte. *A. decumbens*, γ, *genuina*, Müll. Arg. in DC. Prodr. xv. ii. 864 (1866). *A. prostrata*, Zeyh. Mss. in Herb. Holm. *Ricinocarpus decumbens*, O. Kuntze, Rev. Gen. Pl. ii. 617 (1891).

Cape Colony: Humansdorp Div.; Gamtous River, *Thunberg*! Near Humansdorp, *Echlon & Zeyher*, 73 partly! *West*, 276! Uitenhage Div.; Zwartkops River, *Drège*! *Echlon*, 162! without precise locality, *Mund & Maire*, 33! *Zeyher*!

Forma **cordata.** Caules glabri; folia basi saepissime distincte cordata, subtus dense olivaceo-puberula.—*A. cordata*, Thunb. Prodr. Pl. Cap. 117 (1800) et in Flor. Cap. ed. Schult. 545 (1823); Spreng. Syst. Veg. iii. 880 (1826). *A. discolor*, E. Mey. in Drège Zwei Pfl. Documente, 161, nomen (1843) ex parte; Hochst. apud Krauss in Flora xxviii. 84 (1845); Eckl. & Zeyh. in Linnaea xx. 213 (1847) ex parte; Müll. Arg. in Linnaea, xxxiv. 38 (1865) ex parte; Zeyh. Mss. *A. discolor*, β *major*, Baill. Adansonia iii. 158 (1862). *A. decumbens*, β *cordata*, Müll. Arg. in DC. Prodr. xv. ii. 864 (1866). *A. decumbens*, Burchell Mss. vix Thunb.

Cape Colony: Riversdale Div.; between Little Vet River and Garcias Pass, *Burchell*, 6925! near Riversdale, *Schlechter*, 1961! Knysna Div.; Gouw Kamma River, *Krauss*, 1826! near Knysna, *Marloth*, 2448 partly! Humansdorp Div.; Riverside at Humansdorp, *Echlon & Zeyher*, 73 partly! *Galpin*, 4576! Uitenhage Div.; Maitland River near the lead mines, *Burchell*, 4494! without precise locality, *Thunberg*! *Sparrman*! *Zeyher*!

Forma **lamiifolia.** Caules parce molliter pilosi; folia basi saepissime distincte cordata, subtus praesertim secus nervos dense patenter pilosa.—*A. lamiifolia*, Scheele in Linnaea xxv. 584 (1852); Baill. Adansonia, iii. 158 (1862). *A. decumbens*, *a villosa*, Müll. Arg. in DC. Prodr. xv. ii. 864 (1866) ex citatione tantum.

Cape Colony: Riversdale Div.; banks of the Vet River near Riversdale, *Muir*, 283! Knysna Div.; near Knysna, *Marloth*, 2448 partly! Albany Div.; without locality, *Bowie*! without precise locality, *Drège* 8242!

A. decumbens is a species of even greater variability than *A. glabrata*, and the five forms here characterised are readily recognisable. This has always been appreciated. Thunberg over a century

ago accorded specific rank to three of these forms; one of the three he referred to another genus. The synonymy cited shows that similar if varying views had been held by other writers. The treatment by Müller, whose careful monograph of 1866 has not since then been critically examined, involved the recognition of four of these five forms, three of them as varieties of *A. decumbens*, the last as a distinct species, *A. grandidentata.*

More closely examined, however, this last form, though at first sight apparently the most distinctive of all, proves in reality to be undeserving of separate recognition. It differs from *Urtica capensis*, as described by the younger Linnaeus in 1781 and from *Tragia villosa*, as described by Thunberg in 1794, which is the same as *A. Kraussiana*, described by Meisner in 1845, only in having the female inflorescences aggregated in a terminal spike in place of being disposed in the axils of the uppermost leaves. In spite of the different facies thus imparted to these two plants, *A. grandidentata* is merely a condition of *A. Kraussiana*, Meisn. (= A. decumbens, var. villosa, *Müll. Arg.*).

The distinction between the typical *A. decumbens* of Thunberg and the form which that author described as *A. cordata* is hardly more tangible. In the original specimens of *A. decumbens* the leaves are all reddish-hoary underneath and are all truncate or only slightly cordate at the base, while in the original specimens of *A. cordata* the leaves are all olive-hoary beneath and are nearly all distinctly cordate at the base. But it was not owing to these real differences that the two forms were separated as species by Thunberg; the main character relied on for their separation was that *A. decumbens* is herbaceous while *A. cordata* is shrubby. Thunberg's belief we know now to be without foundation; we now know too that while the main branches have leaves that conform with those of the original *A. cordata*, the secondary branches have leaves that agree with those of the original *A. decumbens*. This was fully appreciated by E. Meyer in dealing with Drège's specimens, some of which, and some also of Zeyher's, show both forms on the same branch; the name *A. discolor*, suggested by E. Meyer, happily indicates the peculiar difference in the colour of the underside of the cordate and the less distinctly cordate leaves. *A. cordata*, Thunb., therefore, so far from being even a distinct variety, is merely a condition of *A. decumbens.*

The only remaining form is that which was originally described by Scheele as *A. lamiifolia.* Though reduced by Müller, in the absence of specimens, to var. *villosa* it resembles much more closely in its general appearance Müller's var. *cordata* from which indeed it only differs in having the nerves beneath pilose with long hairs instead of having the nerves very shortly puberulous. Now it is found that even this distinction breaks down, since in certain specimens collected by Marloth we find leaves characteristic of *A. cordata* and leaves characteristic of *A. lamiifolia* in plants which have grown side by side. The true position of the form *lamiifolia* is midway between the forms *cordata* and *villosa* and the true significance of the form does not lie in its differences from these two, but in its testimony that they themselves do not really differ from each other.

Having regard, however, to the extreme diversity of view which has hitherto prevailed, and to the convenience from the bibliographical standpoint which the division of the species involves, it

seems better to separate those forms with long hairs on the leaves beneath from the forms in which there is only a short close hoary tomentum; treating the former, which coincides with Müller's variety *a*, *villosa* but includes also *A. grandidentata*, as the type, and treating the latter as a distinct variety, β, *decumbens*, which includes Müller's variety β, *cordata*.

8. **Acalypha senensis**, *Klotzsch in Peters Reise Mossamb. Bot.* 96 (1862); *Hutchinson in Dyer, Fl. Trop. Afr.* vi. i. 888 (1912).—Spicae 1–sexuales; plantae monoicae; folia longe petiolata; caules erecti; bracteae foemineae glandulis stipitatis dense obsitae, nec tamen setosae.

Bechuanaland: Masupa River in Banquakatse Territory, *Holub*!

Transvaal: near Pretoria, *Burke*! *Scott Elliot*, 1398! *Rehmann*, 4285! *Fehr*, 58! *Wilms*, 1321a! *Burtt Davy*, 695! 725! 5380! *Bolus*, 10838! *Leendertz*, 56! Aapies River, *Burke*! Boshveld, Klippan, *Rehmann*, 5330! Houtbosch, *Rehmann*, 5915! Rustenberg, *Collins*, 70! Warmbaths, *Leendertz*, 1561! Waterval Onder, *Jenkins*, 6717! Lydenberg, *Wilms*, 1321 partly! Johannesberg, *Marloth*, 3830! Shilouvane, *Junod*, 1039! 2178!

Very close to, but still probably deserving to be considered a species apart from *A. petiolaris*, Hochst. A full account of the distribution of this species in Tropical Africa, where it is rather widely spread, and of its synonymy, has been given by one of us in the Flora of Tropical Africa.

9. **Acalypha petiolaris**, *Hochst. apud Krauss in Flora* xxviii. 83 (1845); *Müll. Arg. in Linnaea* xxxiv. 29 (1865) *et in DC. Prodr.* xv. ii. 847 (1866).—Spicae 1-sexuales; plantae monoicae; folia longe petiolata; caules decumbentes, bracteae foemineae dense setosae, parcissime glandulosae.—*A. languida*, E. Mey. in Drège Zwei Pfl. Documente, 161, nomen (1843); Sond. in Linnaea xxiii. 116 (1850); Baill. Adansonia, iii. 157 (1863); Müll. Arg. in Linnaea xxxiv. 29 (1865) et in DC. Prodr. xv. ii. 848 (1866). *A. brachiata*, Krauss in Flora xxviii. 83 (1845), nec E. Mey. *A. tenuis*, Müll. Arg. in Linnaea xxxiv. 30 (1865) et in DC. Prodr. xv. ii. 848 (1866), var. α, *glandulosa* et var. β, *eglandulosa* amb. inclus. *Ricinocarpus languidus*, O. Kuntze, Rev. Gen. Pl. ii. 618 (1891). *R. petiolaris*, O. Kuntze, Rev. Gen. Pl. ii. 618 (1891).

Cape Colony: Komgha Div.; near the Kei River mouth, *Flanagan*, 454!

Transkei: Bashee, *Drège*, a! 4594! Kentani, *Miss Pegler*, 870!

Pondoland: between the Umtata River and St. John's River, *Drège*, b! Murchison, *Bachmann*, 791!

Griqualand East: Clydesdale, 2500 ft., *Tyson*, 1232! 2568! 2693! 2694!

Natal; near Durban, *Krauss*, 319! *Gueinzius*, 169! 506! *Gerrard & McKen*, 617! *Rehmann*, 8803! *Wood*, 68! 1408! near Phoenix, *Schlechter*, 3026! near Maritzburg, *Krauss*, 367! Inanda, 2000 ft., *Wood*, 254! Camperdown, 2000 ft., *Miss Franks in Herb. Wood*, 11771! *Rehmann*, 7795! between Umzimkulu River and Umkomanzi River, *Drège*, c! 8421! Umgeni, *Rehmann*, 8802 partly! Umkomaas, *Engler*, 2569! Marianhill, *Landauer*, 223! Friedenau, 1300 ft., *Rudatis*, 1185! without precise locality, *Wahlberg*!

Lourenço Marques : Ressano Garcia, *Schlechter*, 11882! Lourenço Marques, *Junod*, 147!

Transvaal : Macalisberg, *Wahlberg*! *Burke*! *Zeyher*, 1519! Wonderboompoort, *Leendertz*, 443! Potgietersrust, *Leendertz*, 2313! near Lydenberg, *Wilms*, 1321 partly! Elandspruitberg, *Schlechter*, 3897! near Barberton, 1900–4000 ft., *Galpin*, 513! 1245! Matkibi's Kom, 500 ft., *Bolus*, 9777! Kaap River, 1200 ft., *Bolus*, 9778!

Swaziland : Low Veld near Mafutane, *Bolus*, 12294!

A very distinct species, broken up by Müller into three, which, however, do not differ from each other even as varieties.

10. **Acalypha Eckloni**, *Baill. Adansonia*, iii. 158 (1863); *Müll. Arg. in Linnaea*, xxxiv. 30 (1865) *et in DC. Prodr.* xv. ii. 849 (1866).—Spicae 1-sexules ; plantae monoicae, annuae.—*A cordata*, E. Mey. in Drège, Zwei Pfl. Documente, 161 (1843) ; Baill. Adansonia, iii. 158 (1863) ; non Thunb. *A. brachiata*, E. Mey., in Drège, Zwei Pfl. Documente, 161, nomen (1843); Baill. Adansonia, iii. 158 (1863). *Ricinocarpus Ecklonii*, O. Kuntze, Rev. Gen. Pl. ii. 617 (1891) et iii. ii. 291 (1893).

Cape Colony : George Div. ; woods near George, 1000 ft., *Schlechter*, 2350! Uitenhage Div. ; near Uitenhage, *Burchell*, 4251! *Mund & Maire*! *Verreaux*! *Burke*! *Prior*! on Van Stadens Mountains, *Burchell*, 4751! Zwartkops River, *Drège*, 4602! *Ecklon*, 74 partly! 609! *Zeyher* 228! 3841! Enon, *Drège*, 2345! 4600! Albany Div. ; near the Kasuga River, *Prior*! Kleinemund near Grahamstown, *MacOwan*, 1507! Grahamstown, *Misses Daly & Gane*, 743! King Williamstown Div. ; Yellowwood River, *Drège* ; King Williamstown, *Sim*, 1468! East London Div. ; East London, *Galpin*, 7790! *Rattray*, 809! Komgha Div. ; near Komgha, 2000 ft., *Flanagan*, 630!

Transkei ; Gekwa River, *Drège*, 4601! Kentani, 1000 ft., *Miss Pegler*, 732!

Tembuland : Perie Forest, *O. Kuntze*!

Pondoland : St. John's River at Omsamwubo, *Drège*!

Natal : near Durban, *Gueinzius*, 8! 168! Inanda, 1800 ft., *Wood* 3148! near Isipingo, *Schlechter*, 2808!

A very distinct species nearest, in spite of its annual habit, to *A. petiolaris*, Hochst. and *A. senensis*, Klotzsch, but with much larger female bracts. Meyer's name *A. brachiata*, though older than Baillon's by twenty years, was not accompanied by a description and so cannot now be taken up. Meyer recognised two distinct varieties ; *α*, with taller stems and almost glabrous leaves, and *β* with short stems and hirsute leaves. But the ample material now available proves that this distinction cannot be sustained.

11. **Acalypha ornata**, *Hochst. ex A. Rich. in Tent. Fl. Abyss.* ii. 247 (1851) ; *Hutchinson in Dyer, Fl. Trop. Afr.* vi. i. 890 (1912).

Lourenço Marques : Lion's Creek, *Schlechter*, 12,198!

There is nothing to add to the account of this species given by one of us in the Flora of Tropical Africa except to record the fact that it extends beyond the tropic into South Africa.

12. **Acalypha Zeyheri**, *Baill. Adansonia*, iii. 156 (1863). Folia subsessilia, glabra vel glabrescentia, eglandulosa ; caules procumbentes.—*A. Zeyheri*, var. *glabrata*, Müll. Arg. in Linnaea xxxiv. 29

(1865) et in DC. Prodr. xv. ii. 847 (1866) quoad Zeyher 3839 tantum, var. *pubescente*, necnon syn. Sond. amb. excludend. *A. pedunculares*, var. *psilogyne*, Müll. Arg. in Linnaea xxxiv, 28 (1865) et in DC. Prodr. xv. ii. 846 (1866), pro parte et quoad Krebs 301 tantum. *Ricinocarpus Zeyheri*, O. Kuntze, Rev. Gen. Pl. ii. 618 (1891).

Cape Colony: Uitenhage Div.; Van Stadensberg, *Ecklon*, 345! *Zeyher*, 3839! *Burchell*, 4726! *Mrs. Paterson*, 886!

This very local but very distinct and easily recognisable *Acalypha*, described by Baillon as a species, has been accepted as such, but in a rather modified and somewhat unsatisfactory fashion, by Müller, who has recognised as a distinct variety what is, with little room for doubt, a different species, and has included in the variety which is based on Baillon's type yet another and even more distinct species. To add to the confusion Müller has placed all of the three forms thus included in *A. Zeyheri* in as many different places, for his own *A. Zeyheri*, var. *pubescens*, is also his own *A. pedunculares*, var. *genuina*; the plant which Sonder named *A. pedunculares* β, *glabrata* is Müller's own *A. pedunculares*, var. *caperonioides*; finally, one of the types only of *A. Zeyheri*, Baill., is left by Müller in this species, the other is transferred to *A. pedunculares*, var. *psilogyne*.

13. **Acalypha peduncularis**, *E. Mey. in Drège, Zwei Pfl. Documente*, 161, *nomen* (1843) *et ex Meisn. apud Krauss in Flora*, xxviii., 82 (1845); *Eckl. & Zeyh. in Linnaea*, xx. 213 (1847); *Sond. in Linnaea*, xxiii. 115 (1850), *syn. Buching. et var.* glabrata *exclus.*; *Baill. Adansonia*, iii., 156 (1863), *syn. Buching. exclus.*; *Pax in Engl. Pfl. Öst.-Afr.*, C. 239 (1895) *ex parte, spp. nyasica tantum.* Folia subsessilia saepe acuta vel subacuta plus minusve pubescentia, eglandulosa; caules herbacei ramosi procumbentes.—*A. pedunculares*, var. *genuina*, Müll. Arg. in Linnaea, xxxiv. 29 (1865) et in DC. Prodr. xv. ii. 846 (1866). *A. Zeyheri*, var. *pubescens*, Müll. Arg. in Linnaea, xxxiv. 29 (1865) et in DC. Prodr. xv. ii. 847 (1866) nec *A. Zeyheri*, Baill. *Ricinocarpus pedunculares*, O. Kuntze, Rev. Gen. Pl. ii., 618 (1891).

Cape Colony: Uitenhage Div.; Bontje's River, 2000 ft., *Drège*, 2309! Enon, *Drège*! near Zwartkops River, *Ecklon*, 214! Alexandria Div.; Zuureberg, 2000–3000 ft., *Drège*! *Cooper*, 3580! Bathurst Div.; between Blue Krantz and Kaffir Drift, *Burchell*, 3707! at Rietfontein between the Kasuga River and Port Alfred, *Burchell*, 4041! Albany Div.; near Grahamstown, 1500–2500 ft., *Ecklon, 75* partly! *Bolton*! *Mrs. Barber*! *MacOwan*, 49! *Galpin*, 191! *Bolus*! Slangkraal, *Burke*! Assegai Bush and Botram, 1000–2000 ft., *Drége*, 4596! Howison's Poort, *Zeyher*, 3838! *Mrs. H. Hutton*! near Sidbury, *Burchell*, 4176! Stockenstroom Div.; sources of the Kat River above Philipstown, 3000–4000 ft., *Ecklon*, 75 partly! Peddie Div.; Fredericksburg, *Gill*! East London Div.; near East London, *Rattray*, 678! *J. Wood in Herb. Galpin*, 3136! British Caffraria; Hangman's Bush, *Cooper*, 147! 3581! without locality, *Masson*! *Hb. Swartz*! *Grondal*! *Delalande*! *Krebs*!

Transkei: Kreili's country, *Bowker*, 292! Kentani, 1200 ft., *Miss Pegler*, 65 partly!

Tembuland: near Bazeia, beyond the Bashee River, 2000 ft., *Baur*, 373!

Pondoland: many localities, *Bachmann*, 783! 790! 792! 793! 1711! *Beyrich*, 102!

Natal: near Durban, *Krauss*, 377 partly! *Gueinzius*, 404 partly! *Gerrard & McKen*, 619! *Sanderson*, 129! *Wood*, 1416 partly! Umgeni, *Rehmann*, 8804! Inanda, *Wood*, 48 partly! Camperdown, *Schlechter*, 3059 partly!

Var. β, **crassa**, *Müll. Arg. in Linnaea*, xxxiv. 28 (1865) *et in DC. Prodr.* xv. ii. 846 (1866). Folia omnia obtusa densius pubescentia; caules subsimplices.—*A. crassa*, Buching. ex Meisn. apud Krauss in Flora, xxviii. 83 (1845). *A. peduncularis*, Sond. in Linnaea, xxiii., 115 (1850), quoad syn. *A. crassa*, Buching.; Baill. Adansonia, iii., 156 (1863), quoad syn. *A. crassa*, Buching.: vix E. Mey. *A. peduncularis*, var. *ferox*, Pax Mss. in Wilms exsicc. No. 2265. *Ricinocarpus peduncularis*, var. *ovatifolius*, O. Kuntze, Rev. Gen. Pl., iii., ii., 292.

Natal: near Durban, *Krauss*, 377 partly! *Gueinzius*, 404 partly! *Sutherland*! *Gerrard*, 521! *Wood*, 90! Camperdown, *Gerrard & McKen*, 1166! near Claremont, *Schlechter*, 3059 mainly! Krantzkloof, *Schlechter*, 3188! Inanda, *Wood*, 640! Pietermaritzburg, *Wilms*, 2265! Riet Vlei, *Fry in Herb. Galpin*, 2722! Alexandria Dist., Dumisa, *Rudatis*, 445! Highland Station, *Kuntze*! Nottingham, *Buchanan*, 143! Klip River, *Sutherland*! without locality, *Hb. Swartz*! *Gerrard*, 373!

A. peduncularis, as treated by one of us in the Flora of Tropical Africa, has been accepted in the sense in which the species was presented by Müller in DC. Prodr. xv. ii. 846, in 1866. In reality there are to the north of the tropic two distinct forms; one of these, confined to Rhodesia, is the plant treated by Müller as *A. peduncularis*, α, *caperonioides* (= *A. caperonioides*, Baill.), the other, met with in Nyasaland and Gazaland, being the plant treated by Müller as *A. peduncularis*, ε, *punctata* (= *A. punctata*, Meisn.). The abundant material of both now available shows that it is better to treat them as distinct species.

The variety here recognised, var. *crassa*, though usually readily separable from *A. peduncularis* proper, is, as Meisner pointed out when he originally described it, not really specifically distinct. Müller made an endeavour to distinguish the *A. peduncularis* issued but not described by E. Meyer in 1843, from the *A. peduncularis* described by Meisner in 1845. But there is no justification for Müller's belief that these two differ. It is true that *A. peduncularis*, E. Mey., itself, is rare in Natal, and that in that colony its place is largely taken by var. *crassa*. But it so happens that the portion of Krauss 377, on which in 1845 Meisner based his description of *A. peduncularis*, is not separable from the plant issued by E. Meyer in 1843 under the same name.

14. **Acalypha glandulifolia**, *Buching. ex Meisn. apud Krauss in Flora*, xxviii. 83 (1845); *Sond. in Linnaea*, xxiii. 116 (1850); *Walp. Ann.* iii. 367 (1852); *Baill. Adansonia*, iii. 157 (1863).—*A. peduncularis*, var. *glandulifolia*, Müll. Arg. in Linnaea, xxxiv. 28 (1865), *et in DC. Prodr.* xv. ii. 846 (1866).

Natal: near Durban, *Krauss*! *Gueinzius*, 170! *Gerrard*, 520! *Sutherland*! *Wood*, 1416 partly! Attercliffe, 800 ft., *Sanderson*, 298! Inanda, 1800 ft., *Wood*, 48 partly! 694! Indwedwe, *Wood*, 1054! Alexandra Dist., Dumisa, 2000–2500 ft., *Rudatis*, 96! 743! 744!

A well-marked species, within which Sonder suggested the recognition of two distinct forms, one with pilose almost simple, the other with glabrous more branching stems. The more ample material now available shows that this subdivision is not essential.

15. **Acalypha entumenica**, *Prain*. Herbacea, prostrata, 3–4·5 dm. longa, simplex, dense foliosa, caulis densius patente setulosus. *Folia* subsessilia, membranacea, ovato-lanceolata vel lanceolata, acuta, basi cuneata vel rotundata, margine distincte serrata, dentibus singulis aut glandulam capitatam stipitatam aut setam basi bulbosam suffulcientibus, 1·25–2·5 cm. longa, 0·5–0·6 cm. lata, utrinque densius pilis basi bulbosis setulosa, et saepe glandulis stipitatis parcius obsita; petiolus setulosus, 1·5 mm. longus; stipulae minimae, membranaceae, caducae. *Inflorescentiae* 1-sexuales, dioicae. *Spicae* maris haud visae. *Spicae* femineae solitariae, terminales, sessiles, demum 2·5–4 cm. longae; bracteae subsessiles, foliaceae, late ovatae vel suborbiculares, acutae, basi rotundatae, margine serratae, 0·6–0·8 cm. longae, 0·8–1·25 cm. latae, margine glandulosae extra densius setulosae glandulosaeque. *Semina* subglobosa.

Zululand: Entumeni, 2000 ft., *Wood*, 3737!

A species most nearly allied to *A. glandulifolia*, Buching., but readily distinguished by its shorter wider female bracts with stalked glands, and by its strigose foliage.

16. **Acalypha depressinervia**, *K. Schum. in Just, Bot. Jahresber.* xxvi. i. 348 (1901).—*A. peduncularis*, var. *angustata*, Müll. Arg. in Linnaea xxxiv. 28 (1865) et in DC. Prodr. xv. ii. 847 (1866), pro parte minima et quoad sp. Wahlberg. tantum; nec *A. angustata*, Sond. *A. Schinzii*, Pax in Bull. Herb. Boiss. vi. 734 (1898), excl. var. *denticulata*. *A. Oweniae*, Harv. Mss. in Herb. T. C. D. *Ricinocarpus depressinervius*, O. Kuntze, Rev. Gen. Pl. iii. ii. 291 (1893).

Transvaal: Macalisberg, *Wahlberg*! Carolina Dist.; Billy's Vlei, *Mitchell*! Houtbosch, *Rehmann*, 5914! Barberton; Saddleback Mountain, 4500–5000 ft., *Galpin*, 638! 1120! near Barberton, and between Komati River Drift and Crocodile River, *Bolus*, 9776!

Orange River Colony: Bester's Vlei near Witzieshoek, 5500 ft., *Flanagan*, 1922! Harrismith, *Sankey* 237!

Basutoland: without precise locality, *Cooper*, 3577!

Natal: near Durban, *Miss Owen*! *Sanderson*! *Wood*, 1416 partly! Inanda, *Wood*, 298! Tugela, *Gerrard*, 618! Near Krantzkloof, 1500 ft., *Schlechter*, 3186! Camperdown, *Rehmann*, 7793! Dalton, 3300 ft., *Rudatis*, 15! between Greytown and Newcastle, *Rudatis*, 2260! Mooi River, 4000–5000 ft., *O. Kuntze*! *Wood*, 3766!

A very distinct species at once distinguishable from every other South African *Acalypha* with subsessile leaves by the entire leaf margins.

17. **Acalypha angustata**, *Sond. in Linnaea* xxiii. 115 (1850); *Walp. Ann.* iii. 367 (1852); *Baill. Adansonia* iii. 157 (1863).—*A. angustata*, var. *glabra*, Sond. l.c. 116 (1850). *A. peduncularis*, var.

angustata, Müll. Arg. in Linnaea xxxiv. 28 (1865) et in DC. Prodr. xv. ii. 847 (1866) pro parte maxima sed sp. Wahlb. exclus. *A. Schinzii*, var. *denticulata*, Pax in Bull. Herb. Boiss. vi. 734 (1898).

Transvaal: Macalisberg, *Burke*, 349! *Zeyher* 1518! Maquasi Mountains, *Nelson*, 231! Pretoria; above Aapies Poort, *Rehmann*, 4284! Derde Poort, *Leendertz*, 363 mainly! Waterval Onder, *Jenkins*, 6735! Elandspruitsberg, *Schlechter*! near Lydenberg, *Wilms*, 1322! 1327! near Johannesberg, *Gilfillan in Herb. Galpin*, 6071! 6172! *Marloth*, 3669! Witbank, *Rogers*, 2545! Marico, *Holub*! Derby Station, 5300 ft., *Burtt Davy*, 7165! Paardeville, near Zeerust, 4500 ft., *Burtt Davy*, 7192! Bethal, *Burtt Davy*, 3834! 5602! Heidelberg, *Leendertz*, 2582! Uitgevallen, *Burtt Davy*, 9150! Krugersdorp, *Holder*, 4548! Ermelo, *Bester*, 2164 partly! Irene, *Burtt Davy*, 747! Hartebeestenek, *Burtt Davy*, 769! without precise locality, *McLea*!

Natal: near Durban, *Gueinzius*, 171! *Gerrard* 519! near Maritzburg, *Wilms*, 2262! Riet Vlei, at Greenwich Farm, *Fry in Herb. Galpin*, 2721!

The two varieties originally distinguished by Sonder can be readily separated in their extreme conditions, but they are connected by a regular gradation of forms, intermediate as regards pubescence, and their continued recognition serves no useful purpose.

18. **Acalypha caperonioides**, *Baill. Adansonia* iii. 157 (1863).—*A. peduncularis*, var. *glabrata*, Sond. in Linnaea xxiii. 115 (1850). *A. Zeyheri*, var. *glabrata*, Müll. Arg. in Linnaea xxxiv. 29 (1865) et in DC. Prodr. xv. ii. 847 (1866) quoad syn. Sond. sed spp. citat. exclud. *A. peduncularis*, var. *caperonioides*, Müll. Arg. in DC. Prodr. xv. ii. 846 (1866). *A. peduncularis*, Hutchinson in Dyer Fl. Trop. Afr. vi. i. 884 (1912) quoad spp. rhodesica; nec E. Mey.

Rhodesia: Myanga; Manika, 6000–7000 ft., *Cecil*, 179! 182! between Umtali and Myanga Mountains, *Cecil*, 167! Salisbury, *Cecil*, 68! *Engler*, 3052! *Rogers*, 4003! Gwelo, *Gardner*, 33! Bulawayo, *Eyler & Johnson*, 1153!

Transvaal: Macalisberg, *Burke*, 83! 153! *Zeyher*, 15, 21! Elandspruitsberg, *Schlechter*! Lydenberg, *Wilms*, 1324! 1328! 1329! Heidelberg, *Wilms*, 1322! *Leendertz*, 2583! Waterval Boven, *Rogers*, 24! Johannesberg, *Marloth*, 3866! Pretoria and vicinity, *Engler*, 2833! *Burtt Davy*, 1988! Road to Wonderboom, *Leendertz*, 321! Wonderboompoort, *Rehmann*, 4553! 4554! between Potchefstroom and Rustenburg, *Roe*! Pinedene, Irene, 4800 ft., *Burtt Davy*, 2305! Ermelo, *Burtt Davy*, 5485! *Bester*, 2164 partly! Marico, Koster, 5300 ft., *Burtt Davy* 7171! Modderfontein, *Miss Haagner*! Barberton, *Miss Ivy Thorncroft*, 30!

Orange River Colony: Parys, *Rogers*, 707!

Var. **Galpini**, *Prain*; a typo foliis membranaceis, utrinque dense persistenter pilis elongatis basi bulbosis vestitis differt.

Transvaal: Barberton, 4000 ft., *Galpin*, 1106!

This variety, of which only female specimens are known, may prove a distinct species.

19. **Acalypha punctata**, *Meisn. apud Krauss in Flora*, xxviii. 83 (1845).—*A peduncularis*, var. *punctata*, Müll. Arg. in Flora, xxxiv. 28 (1865) et in DC. Prodr. xv. ii. 846 (1866). *A. peduncularis*, Pax in Engl. Pfl. Ost.-Afr. C. 239 (1895) partim; Hutchinson in

Dyer, Fl. Trop. Afr. vi. i. 884 partim et quoad spp. gaz. et nyas. tantum (1912); nec E. Mey. *Ricinocarpus peduncularis*, var. *punctatus*, O. Kuntze, Rev. Gen. Pl. iii. ii. 292 (1893).

Orange River Colony: Bester's Vlei, Witzieshoek, 5700 ft., *Bolus*, 8251! without precise locality *Rogers*!

Transvaal: Barberton, 2500–4000 ft., *Galpin*, 429! Mac Mac Creek, *Mudd*!

Transkei: Kentani, 1200 ft., *Miss Pegler*, 65 partly!

Tembuland: Umtata, *Miss Mason* (icon.)!

Pondoland: Fort Grosvenor, *Bachmann*, 785! 789! 794!

Griqualand East: near Kokstad, 3800 ft., *Tyson* 1107! Clydesdale, 2500 ft., *Tyson*, 3107!

Natal: near Durban, *Krauss*, 377 mainly! *Verreaux*! *Gueinzius*! *Wood*! Bellair, 220 ft., *Schlechter*, 3105! Inanda, 1800 ft., *Wood*, 296! 697! Attercliffe, 800 ft., *Sanderson*, 344! Camperdown, 2000 ft., *Wood*, 864! 4106! Friedenau, 2000 ft., *Rudatis*, 779! 780! Dumisa, Fairfield, 2700 ft., *Rudatis*, 1201! Ladysmith, 3300 ft., *Kuntze*! Klip River, 3500–4000 ft., *Sutherland*! Lidgetten, 3900 ft., *Wood*, 6201!

Zululand: without precise locality, *Gerrard & Mc Ken*, 1167!

Gazaland: Upper Buzi, 3000 ft., *Swynnerton* 383!

Nyasaland: Zomba Plateau, 5000–6000 ft., *Whyte*!

Var. **longifolia**, *Prain*; a typo foliis lanceolatis vel lineari-lanceolatis acutis, nec ovato-lanceolatis vel ovatis inferioribus obtusis, differt.—*A. longifolia*, E. Meyer Mss. in Herb. Lübeck.

Transvaal: Lydenburg; Witklip, 4800 ft., *Burtt Davy*, 7264! Barberton; Fairview Farm, *Burtt Davy*, 4080! Pretoria; Aapies River, *Rehmann*, 4016! 4283! *Leendertz*, 1003! *Scott Elliot* 1449! Derde Poort, *Leendertz*, 4016! 363 partly!

Transkei: between the Gekua River and the Bashee River, *Drège*, 5380!

Tembuland: Bazeia, 2000 ft., *Baur*, 269!

Pondoland: Fort Grosvenor, *Bachmann*, 788!

Griqualand East: near Kokstad, 4800 ft., *Tyson*, 1231!

Var. **Rogersii**, *Prain*; a typo necnon a varietate praecedenti foliis duplo brevioribus omnibus obtusis differt.

Transvaal: Waterval Boven, 4800 ft., *Rogers*, 288! Swaziland, *Stewart* (*Hb. Transv.* 8917)! Barberton; Saddleback Mt., 4500 ft., *Galpin*, 1121! Shilouvane, *Junod*, 1325!

The form here described as var. *longifolia*, though in extreme cases very distinct from typical *A. punctata*, passes insensibly into the type. Sometimes mistaken in the field for *A. angustata*, Sond., it is readily distinguishable by its different female bracts. Like *A. peduncularis*, *A. punctata* var. *longifolia* is sometimes monoecious, with axillary male spikes and a terminal female spike on the same plant. Occasionally too the foliage is variegated as in *Codiaeum*.

The form here described as var. *Rogersii*, is almost certain to prove, when fuller material is available, deserving of recognition as a distinct species.

20. **Acalypha Wilmsii**, *Pax Mss. in Herb. Berol.* Herbacea, erecta, 3–6 dm. alta, parce ramosa; caulis pubescens vel patenter setulosus. *Folia* subsessilia, membranacea, adulta firmula, ovata vel ovato-lanceolata, ima obtusa, cetera saepissima acuta, bas

rotundata vel parum cordata, margine breviter dentata, 5–7·5 cm. longa, 4–5 cm. lata, utrinque praesertim secus nervos pubescentia vel strigosa, et secus venas graciliores glandulis longe stipitatis obsita ; petiolus 2 mm. longus, setulosus ; stipulae 3 mm. longae, lanceolatae, persistentes. *Inflorescentiae* 1-sexuales, dioicae. *Spicae* maris axillares, solitariae, pedunculatae ; pedunculi 2·5–4 cm. longi, pubescentes vel dense setulosi glandulosique ; pars florifera cylindrica, gracilior, densa, 2·5–3 cm. longa ; alabastra molliter pubescentia vel setulosa. *Spicae* femineae solitariae, terminales, sessiles, primum 2·5 cm. demum 7 cm. longae ; bracteae 1-florae, subsessiles, foliaceae, late ovato-cordatae, acutae, 1·75–2 cm. longae, 2·5–3 cm. latae, margine dentatae dentibus triangularibus brevibus, dense pubescentes vel setulosae et glandulis longe stipitatis obsitae. *Sepala* 3, acuta, pubescentia glandulosaque. *Ovarium* distincte 3-lobum, molliter pubescens et glandulosum ; styli 3, basi cuneati, superne laciniati. *Semina* subglobosa.—*Ricinocarpus pedunc ularis*, var. *genuinus*, O. Kuntze, Rev. Gen. Pl. iii. ii. 292, nec *R. pedunc ularis*, O. Kuntze, l.c. ii. 618. *R. pedunc ularis*, var. *Radula*, O. Kuntze, l.c. iii. ii. 292 (1893) nec *Acalypha Radula*, Baker.

Transvaal : Lydenberg ; Spitzkop, *Wilms*, 1326 ! Crocodile River, *Wilms*, 1330 ! Paardeplats, *Wilms*, 1331 ! Ermelo ; *Tennant*, 6807 ! *Burtt Davy*, 9390 ! *Leendertz*, 2997 ! Billy's Vlei, *Burtt Davy*, 9211 ! Barberton ; Saddleback Mt., 4500–4800 ft., *Galpin*, 1119 ! 1126 !

Pondoland : Fort Grosvenor, *Bachmann*, 787 ! Griqualand East : Clydesdale, 2500 ft., *Tyson*, 2602 ! 2603 !

Natal : near the Mooi River, 4000 ft., *Wood*, 4103 ! Highland Station, 5300 ft., *Kuntze* ! Van Reenen's Pass, *Kuntze* !

Review of Acalypha chamaedrifolia.

Müller's treatment of the West Indian *A. chamaedrifolia* is somewhat on a par with that accorded to *A. pedunc ularis*, and we have felt constrained to re-establish most of the species reduced by him as varieties to that species.

Four of these, his var. *pendula* (*A. pendula*, Wright), var. *glechomaefolia* (*A. glechomaefolia*, A. Rich.), var. *nana* (*A. nana*, Griseb.) and var. *genuina* (*A. chamaedrifolia*, emend.) are shown in our Plate figs. 1, 2, 3 and 4 respectively, and from these drawings some idea of Müller's views of this group may be gained. Except in the case of var. *genuina*, the figures have been prepared from the actual types, which are at Kew, and we have seen no intermediate forms which in any way link them up. *A. fissa* (*A. chamaedrifolia*, var. *fissa*, Müll. Arg.), for which there was scarcely space on the plate, is perhaps the most easily recognised of the group, on account of the stems rooting at the nodes, the shape and toothing of the leaves, and the deeply 5-lobed female bracts which are most closely approached by those of *A. glechomaefolia* (fig. 2a).

Below is given the synonymy and a short description of each species indicating the more salient features by which they may be distinguished.

A. chamaedrifolia, *Müll. Arg. in DC. Prodr.*, xv. pt. ii. 879 (emend.); Duss in Ann. Inst. Colon. Marseill. vol. iii. p. 35; Urban, Symb. Antill. vol. iv. p. 347.

Croton chamaedrifolius, Lam. Encycl. vol. ii. p. 215 (1786).

Acalypha reptans, Swartz, Prodr. p. 99 (1788), et Flor. Ind. occid. vol. ii. p. 1170; Willd. Sp. Pl. vol. iv. p. 523; Griseb. Flor. Brit. West Ind. p. 48; Duss, l.c.

A. corchorifolia, Willd. l.c. 524 (1805); Chapman, Fl. of the Southern Unit. States, p. 406.

A. adscendens, Hornem. Hort. Hafn. Suppl. 108 (1819).

A. reptans, var. *genuina*, Müll. Arg. in Linnaea, vol. xxxiv. p. 48, excl. syn. Klotzsch. *A. reptans*, var. *glechomaefolia*, Müll. Arg. l.c., partly, as to *Wright*, 572.

A. patens, Müll. Arg. in DC. Prodr. vol. xv. pt. ii. 848 (1866). *A. chamaedrifolia*, var. *genuina*, Müll. Arg. in DC. l.c. 879, excl. syn. Klotzsch, and var. *glechomaefolia*, Müll. Arg. l.c., partly, as to *Wright*, 572.

Ricinocarpus chamaedrifolius, O. Ktze, Rev. Gen. Pl. vol. ii. p. 617 (1891). ——Sloan, Hist. Jam. vol. i. t. 82, fig. 3; Plumier, Plant. Amer. t. 172, fig. 2.

Caules patentes vel suberecti, numerosi, simplices, rhizomate lignoso horizontale orti; folia heteromorpha, inferiora minora, suborbicularia, superiora majora, oblongo-ovata vel oblongo-lanceolata, basi rotundata vel truncata, 1–3 cm. longa, plerumque glabra vel fere glabra; inflorescentiae bisexuales, et terminales et in foliorum superiorum axillis aggregati, inferne ♀, superne ♂; bractea ♀ et pistillum ut in fig. 4a et 4b.

Cuba: Eastern district, *Wright*, 572! 1672! near Monte Verde, *Wright*, 1426! Santa Clara Province; Cieneguita, Cienfuegos district, *Combs*, 140! Haland Province; Fecha, *Wilson*, 1117!

Isle of Pines: near Nueva Gerona, *Curtiss*, 481!

Jamaica: without precise locality, *Wright in Herb Forsyth*! *Grisebach*, 423! St. Andrews, *Mc Nab*!

San Domingo: *Schomburgk*, 119!

St. Thomas: Cowells Hill, *Eggers*, 118!

Guadeloupe: *Duchassaing*!

Occurs also in S. E. Florida, and according to Urban in the islands of Porto Rico, Hispaniola and St. Croix.

We have not seen *A. microphylla*, Klotzsch, from N.W. Mexico, reduced to this species by Müller, but from the description it can scarcely be the same. The leaves are described as being 4–6 in. long and 3–4 in. broad, and the male spikes axillary and the female terminal.

A. pendula, *Wright ex Griseb. in Goett. Nachr.* 1865, 176.

A. chamaedrifolia, var. *pendula*, Müll. Arg. in DC. Prodr. vol. xv. pt. ii. p. 879 (1866).

Caules lapidibus penduli (*Wright*); radix non visa; folia inter se similia, ovata vel oblongo-ovata, basi truncata vel leviter cordata, 1·2–4 cm. longa, 1–2·3 cm. lata, marginibus non incrassatis, utrinque molliter tomentosa, demum pubescentia; inflorescentiae et axillares et terminales: illae e floribus ♀ 1 vel 2 sessilibus constitutae; hae

androgynae, inferne ♀, superne ♂ ; bractea ♀ et pistillum ut in fig. 1a et b.

Cuba : La Calalina, *Wright*, 1981 !

A. glechomaefolia, *A. Rich. Fl. Cub. Fanerog.*, ii. 205 (1853).

A. reptans, var. *glechomaefolia*, Müll. Arg. in Linnaea, vol. xxxiv. p. 48, excl. specim. *Wright*, 572.

A. chamaedrifolia, var. *glechomaefolia*, Müll. Arg. in DC. Prodr. vol. xv. pt. ii. p. 879, excl. specim. *Wright*, 572.

Caules rhizomate prostrati, e nodis inferioribus radicantes ; folia inter se similia, orbicularia, basi alte cordata, grosse crenata, 8–10 mm. diametro, margine non incrassata, utrinque pubescentia et supra parce setosa ; inflorescentiae terminales, inferne ♀, superne ♂ ; bractea ♀ ut in fig. 2a ; ovarium pilosum.

Cuba : without precise locality, *Ramon de la Sagra*, 126 !

San Domingo : Jamoa, *Eggers*, 2637 ! without precise locality, *Schomburgk* !

Müller quotes *Wright*, 572, from Cuba as being this species, but it seems to us to be a small-leaved form of *A. chamaedrifolia*.

A. fissa, *Hutchinson*.

A. chamaedrifolia, var. *fissa*, Müll. Arg. in DC. Prodr. vol. xv. pt. ii. p. 879.

Caules prostrati, nodis radicantes, pilis reflexis pubescentes, internodiis 1–2·5 cm. longis. *Folia* inter se similia, ovata, basi truncata vel rotundata, 8–16 mm. longa, 8–13 mm. lata, grosse 10–12 crenata, membranacea, supra setoso-pilosa, infra patente pubescentia, basi trinervia, nervis infra prominulis ; petioli 0·3–1·5 cm. longi, pubescentes. *Flores* monoici. *Inflorescentiae* et axillares et terminales, axillares ♀ breves, terminales androgynae, inferne ♀, superne ♂. *Gemmae* ♂ obtuse quadrangulares, glabrae. *Bracteae* ♀ ambitu transverse oblongae, 3·5 cm. latae, alte 5– lobatae, submembranaceae, extra pilosae, lobis ovatis subacutis 1 mm. longis. *Sepala* parva, ciliata. *Ovarium* subglobosum, longe pilosum ; styli graciles, tenuiter laciniati.

Cuba : without precise locality, *Wright*, 1983 !

A. nana, *Griseb. in Goett. Nachr.* 1865, 176, *nomen*.

A. pygmaea, Griseb. l. c., non A. Rich., fide Müll. Arg.

A. chamaedrifolia, var. *nana*, Müll. Arg. in DC. Prodr. vol. xv. pt. ii. p. 880 (1866).

Caules prostrati, rhizomate lignoso erecto·apice patentes ; folia inter se similia, orbicularia vel ovato-orbicularia, basi rotundata, 2–4 mm. diametro, marginibus cartilagine incrassatis, supra parce setoso-pilosa ; inflorescentiae unisexuales, ♂ non visae ; inflorescentia ♀ uniflora, flore terminali ; bractea ♀ et pistillum ut in fig. 3a et 3b.

Cuba : without precise locality, *Wright*, 1984 !

Apparently a very distinct species.

A. pygmaea, *A. Rich. Fl. Cub. Fanerog.*, iii. 205 (1853).

A. reptans, var. *pygmaea*, Müll. Arg. in Linnaea, vol. xxxiv. p. 49.

A. chamaedrifolia, var. *pygmaea*, Müll. Arg. in DC. Prodr. vol. xv. pt. ii. 880 (1866).

Caules di usi, e basi ramosi ; folia ovata, acuta, basi obtusa (4–6 mm. longa, ex *Müller*), serrata, nervis pubescentibus ; inflorescentia brevis, subterminalis, androgyna, inferne floribus 2–3 subsessilibus constituta, superne ♂ ; bractea ♀ 5-dentata.

Cuba : near the sea, *Ramon de la Sagra* (Herb. Paris).

We have not seen an example of this species, but from the description, an adaptation of which is given above, it is evidently quite distinct and most nearly allied to *A. nana*.

Explanation of Plate.

Fig. 1, shoot of *Acalypha pendula*.
1a, female bract of same.
1b, pistil.

Fig. 2, plant of *A. glechomaefolia*.
2a, female bract of same.

Fig. 3, plant of *A. nana*.
3a, female bract of same.
3b, pistil.

Fig. 4, portion of plant of *A. chamaedrifolia*.
4a, female bract of same.
4b, pistil.

Analyses enlarged.

II.—NEW ORCHIDS: DECADE 39.

381. **Liparis nana**, *Rolfe* ; inter species Asiaticas habitu nana, floribus atropurpureis, columna lata et fere recta distinctis.

Herba terrestris, nana, circiter 3·5 cm. alta. *Folia* 3–4, rosulata, patentia, ovato-oblonga, subobtusa, undulata, 2–2·5 cm. longa. *Scapus* circiter 3·5 cm. altus, angulatus ; racemus brevis, subcorymbosus. *Bracteae* ovato-lanceolatae, acutae, basi subconcavae, 3–5 mm. longae. *Pedicelli* 7–9 mm. longi. *Flores* purpurei. *Sepala* subpatentia, ovato-oblonga, subacuta, leviter carinata, 6 mm. longa. *Petala* recurva, linearia, acuta, 5 mm. longa. *Labellum* sessile, late cordato-oblongum, apiculatum, conduplicatum, margine denticulatum, 4 mm. longum, per discum late canaliculatum, basi septo transverso nitido instructum. *Columna* oblonga, lata, medio canaliculata, 4 mm. longa, apice breviter bidentata.

Annam.

Sent to Kew for determination by Mr. Gurney Wilson, Glenthorne, Haywards Heath, who remarks that it was found growing on an imported plant of *Cymbidium insigne*, Rolfe. It is a very small plant, with dark purple flowers, and somewhat anomalous in its very broad nearly straight column. Its precise affinity remains at present uncertain.

382. **Cirrhopetalum miniatum**, *Rolfe* ; a *C. gracillimo*, Rolfe, scapis brevioribus, floribus majoribus, miniatis, sepalo postico et petalis flavo-pilosis valde differt.

Pseudobulbi tetragono-ovoidei, rugosi, circiter 1·2 cm. longi, 1 cm. lati, monophylli. *Folia* sessilia, lanceolato-oblonga, subacuta, coriacea, circiter 7 cm. longa, 1·5 cm. lata. *Scapi* graciles, 10 cm. longi, basi vaginis angustis paucis obtecti, apice circiter 8-flori. *Bracteae* lineari-lanceolatae, subacutae, 3–4 mm. longae. *Pedicelli* subumbellati, graciles, circiter 8 mm. longi. *Flores* elongati, miniati, petalis et sepalo postico marginibus pilis flavis ornatis. *Sepalum* posticum ovatum, acuminato-aristatum, valde concavum, circiter 8 mm. longum, marginibus longe pilosis; sepala lateralia basi connata, anguste lineari-oblonga, apice longissime caudato-acuminata et libera, 7–9 cm. longa. *Petala* oblique-ovata, aristato-acuminata, vix concava, 5 mm. longa, marginibus longe pilosis. *Labellum* recurvum, oblongum, subacutum, carnosum, 2·5 mm. longum. *Columna* lata, oblonga, 2 mm. longa; dentes graciles, subulati, 1 mm. longi.

ANNAM.

A remarkable species which flowered in the Royal Botanic Gardens, Glasnevin, in September, 1910. Sir F. W. Moore states that it was purchased from Messrs. Sander and Sons as having been imported with *Dendrobium Bronckartii*, De Wildem. The flowers are vermilion-coloured, with bright yellow hairs on the margins of the petals and dorsal sepal, the anther-case yellow, and the teeth of the column whitish.

383. **Calanthe violacea**, *Rolfe; C. Masucae*, *Lindl.*, affinis, sed bracteis angustioribus et recurvis, labelli lobis lateralibus lobo intermedio minoribus et divaricatis differt.

Herba terrestris. *Folia* radicalia petiolata; limbus late elliptico-lanceolatus, breviter et abrupte acuminatus, plicatus, submembranaceus, circiter 25 cm. longus, 10 cm. latus. *Scapus* erectus, circiter 30 cm. longus, subvelutinus; racemus brevis, multiflorus. *Bracteae* oblongo-lanceolatae, acutae, recurvae, 1–1·8 cm. longae, purpureo-suffusae. *Pedicelli* 2·5–3 cm. longi, puberuli, purpurei. *Flores* speciosi, lilacino-purpurei, labello violaceo-purpureo. *Sepala* et *petala* patentia vel recurva, elliptico-lanceolata, acuta, 1·5–1·8 cm. longa. *Labellum* columnae adnatum, lamina 3-loba, 1·2 cm. longa; lobus intermedius late triangulari-obcordatus, 1·3 cm. latus, apice breviter bilobus; lobi laterales divaricati, elliptico-oblongi, subobtusi, circiter 4 mm. longi; discus per medium carinatus, basi prominente verrucosus; calcar cylindricum, incurvum, circiter 3 cm. longum. *Columna* lata, 5 mm. longa.

MADAGASCAR.

Imported by Messrs. Charlesworth & Co., Haywards Heath, and flowered in their nursery in January, 1912. The sepals and petals are light purple, and the lip violet-purple, becoming brownish as it fades, while the crest of the lip is yellowish brown.

384. **Epidendrum (Nanodes) congestum**, *Rolfe;* ab *E. discolore*, Benth., floribus minoribus pallide viridibus differt.

Herba epiphytica, nana, 3–4 cm. alta. *Folia* disticha, patentia, ovato-oblonga, obtusa, 1·5–2·5 cm. longa, 7–9 mm. lata, coriacea, carinata, margine revoluta et minutissime denticulata. *Bracteae* imbricatae, conduplicatae, ovatae, obtusae, minutissime denticulatae, circiter 1 cm. longae. *Pedicelli* 5–6 mm. longi. *Flores* terminales,

2–3, ad apices ramorum congesti, subcarnosi. *Sepalum* posticum reflexum, ovatum, subacutum, 1 cm. longum ; sepala lateralia patentia, oblongo-lanceolata, acuta, valide carinata, concava, 1 cm. longa. *Petala* lanceolata, acuta, 9 mm. longa, apice subrecurva. *Labellum* columnae adnatum, limbus cordato-ovatus, acutus, 5–6 mm. longus. *Columna* lata, circiter 6 mm. longa.

Costa Rica.

Flowered in the Royal Botanic Gardens, Glasnevin, in January, 1911. The flowers are pale green, with an emerald green lip, and the column suffused and mottled with red purple.

385. **Eulophia Macowani**, *Rolfe* in Dyer Fl. Cap. vol. v. sect. iii. p. 38, anglice ; affinis *E. Haygarthii*, Rolfe, foliis angustioribus, petalis latioribus subobtusis et labello breviter vel obscure trilobo differt.

Rhizoma validum ; nodi incrassati. *Folia* 5–7, fasciculata, elongato-linearia vel anguste ensiformia, acuta, crebre venosa, recurva vel suberecta, 15–30 cm. longa, basi late vaginata. *Scapi* laterales, 30–45 cm. longi, vaginis lanceolatis imbricatis obtecti ; racemi 10–15 cm. longi, saepe laxi, multiflori. *Bracteae* lanceolatae, acuminatae, 1·5–2·5 cm. longae. *Pedicelli* circiter 2 cm. longi. *Flores* majusculi, flavi. *Sepala* oblongo-lanceolata, acuta, circiter 2 cm. longa. *Petala* ovata vel elliptico-ovata, acuta vel subacuta, sepalis paullo longiora et circiter triplo latiora. *Labellum* late ellipticum, petalis brevius, breviter vel obscure triloba ; lobi laterales parvi, late oblongi vel rotundati ; lobus intermedius late ellipticus vel suborbicularis ; discus carinis 3 papillosis vel cristatis instructus, basi interdum 5-carinatus ; calcar clavatum, vel oblongum, saepe incurvum, 4–6 mm. longum. *Columna* late oblonga, 4–6 mm. longa. *Capsula* late elliptica, circiter 4 cm. longa.

S. Africa. Kasonga River, *MacOwan*, 184 ; Kowie River mouth, *Hutton in MacOwan & Bolus Herb. Norm. Austr.-Afr.*, 1215.

386. **Eulophia acuminata**, *Rolfe* in Dyer Fl. Cap. vol. v. sect. iii. p. 39, anglice ; ab *E. calanthoides*, Schlechter, sepalis petalisque multo angustioribus et acuminatis differt.

Folia non vidi. *Scapi* validi, 30–60 cm. longi, vaginis numerosis lanceolatis imbricatis obtecti ; racemus 10–20 cm. longus, multiflorus. *Bracteae* lineari-lanceolatae, acuminatae, 2·5–4 cm. longae. *Pedicelli* circiter 2 cm. longi. *Flores* majusculi, flavi. *Sepala* oblongo-lanceolata, acuminatissima, 2·5–3 cm. longa. *Petala* elliptico-oblonga, acuminatissima, sepalis paullo longiora et duplo latiora *Labellum* breviter trilobum, petalis brevius ; lobi laterales breves obtusi vel rotundati, venis numerosis radiatis ; lobus intermedius elliptico-oblongus, apiculatus ; discus carinis 3 verrucosis instructus, carinis apice tenuibus et puberulis ; calcar oblongum, obtusum, curvatum, 4 mm. longum. *Columna* clavata, lata, 4 mm. longa. *E. calanthoides*, Bolus, Ic. Orch. Austr.-Afr. i. sub t. 51, ex parte (non Schlechter).

S. Africa. Natal : near Estcourt, *Wood*, 3428.

387. **Eulophia Allisoni**, *Rolfe* in Dyer Fl. Cap. vol. v. sect. iii. p. 39, anglice ; affinis *E. calanthoides*, Schlechter, sed floribus minoribus et labello obscure trilobo differt.

Folia 5–7, fasciculata, ensiformia, acuta, plicata (immatura), circiter 10 cm. longa, 8–12 mm. lata. *Scapi* crassiusculi, circiter 75 cm. alti, vaginis paucis laxis obtecti; racemi 15 cm. longi, multiflori. *Bracteae* lineari-lanceolatae, acuminatae, 2–2·5 cm. longae. *Pedicelli* circiter 1·3 cm. longi. *Flores* majusculi, pallide flavi, labelli lobis lateralibus venis rufis ornatis. *Sepala* lineari-lanceolata, acuminatissima, 2–2·5 cm. longa. *Petala* elliptico-oblonga, subacuta, sepalis brevioribus et triplo longioribus. *Labellum* subintegrum vel obscure trilobum, ellipticum, apiculatum, petalis aequilongum et paullo latius; lobi laterales brevissimi vel subobsoleti; discus basi carinis 5 crassiusculis obtectus, prope apicem venis numerosis laevibus vel puberulis ornatus; calcar clavatum, circiter 3 mm. longum. *Columna* clavata, 6 mm. longa. *E. calanthoides*, Bolus Ic. Orch. Austr.-Afr. i. t. 51, ex parte.

S. Africa. Without precise locality, *Allison*; Albany Div., near Grahamstown, *Todd*.

388. **Eulophia Bakeri**, *Rolfe* in Dyer Fl. Cap. vol. v. sect. iii. p. 40, anglice; affinis *E. calanthoides*, Schlechter, petalis latioribus, labelli lobo intermedio brevi et disci carinis basi verrucosis apice longe fimbriatis differt.

Rhizoma non vidi. *Folia* elongato-lanceolata, acuta, basi attenuata, circiter 20 cm. longa, 2 cm. lata. *Scapus* circiter 30 cm. longus; racemus 6–8-florus. *Flores* carnei. *Sepala* oblongo-lanceolata, acuta vel breviter acuminata, circiter 2 cm. longa. *Petala* ovato-elliptica, minute apiculata, sepalis paullo longiora et duplo latiora. *Labellum* ovato-ellipticum, petalis brevius, apice obtusum vel rotundatum; lobi laterales angusti, apice obtusi vel rotundati; lobus intermedius late ellipticus vel suborbicularis; discus carinis 5–7 apice fimbriatis basi verrucosis instructus; calcar oblongum, subobtusum, paullo curvatum, 4 mm. longum. *Columna* late oblonga, 6–7 mm. longa.

S. Africa. Transvaal: high ridge outside Johannesburg, 1500 m., *Baker*.

Described from rather imperfect material.

389. **Eulophia Rehmanni**, *Rolfe* in Dyer Fl. Cap. vol. v. sect. iii. p. 41, anglice; affinis *E. Bakeri*, Rolfe, labello late ovato petalis multo parviore et disci carinis minute crenulatis differt.

Rhizoma non vidi. *Folia* fasciculata, 6–8, patentia, linearioblonga, acuminata, 5–7 nervia, basi attenuata et conduplicata, 10–15 cm. longa, 2–3 cm. lata, basi vaginis 2–3 brevibus obtecta. *Scapi* erecti, circiter 45 cm. longi, vaginis 3–4 distantibus obtecti; racemi densiusculi, 8–12-flori. *Bracteae* lineari-lanceolatae, acuminatae, 2–2·5 cm. longae. *Pedicelli* circiter 1·5 cm. longi. *Flores* majusculi. *Sepala* lanceolata, acuminata, 2 cm. longa. *Petala* elliptico-ovata, subobtusa, sepalis paullo longiora et triplo latiora. *Labellum* ovatum, trilobum, petalis brevius et angustius; lobi laterales late rotundati, breves; lobus intermedius ovatus, subacutus; discus basi carinis numerosis approximatis crenulatis instructus; calcar gracile, clavatum, 6 mm. longum. *Columna* lata, 4–5 mm. longa.

S. Africa. Transvaal: Houtbosch, *Rehmann*, 5845.

390. **Eulophia latipetala**, *Rolfe* in Dyer Fl. Cap. vol. v. sect. iii. p. 41, anglice ; species distinctissima, a praecedente foliis et petalis multo latioribus facile distinguenda.

Folia fasciculata, 5–7, late lineari-oblonga, attenuata, 5–7-nervia, basi conduplicata, 10–30 cm. longa, 2·5–4 cm. lata, basi vaginis 2–3 brevibus obtecta. *Scapi* erecti, crassiusculi, 30 cm. longi, basi vaginis numerosis latis imbricatis obtecti ; racemi desiusculi, 6–12-flori. *Bracteae* lineari-lanceolatae, acuminatae, 2–2·5 cm. longae. *Pedicelli* circiter 1·2 cm. longi. *Flores* majusculi. *Sepala* ovato-oblonga, acuta, circiter 2 cm. longa. *Petala* late ovata, subobtusa, 2 cm. longa, circiter 1·2 cm. lata. *Labellum* 2 cm. longum, fere 1·2 cm. latum, trilobum ; lobi laterales late rotundati, abbreviati ; lobus intermedius suborbiculari - oblongus, obtusus ; discus basi carinis 3–5 crassiusculis laevibus instructus ; calcar subconicum, obtusum, abbreviatum. *Columna* lata, 4 mm. longa.

S. Africa. Transvaal : Houtbosch, Pietersburg district, 1740 m., *Bolus*, 10,975.

III.—TEFF.

(*Eragrostis abysinnica*, Schrad.).

Joseph Burtt Davy.

In accordance with a promise made some time since, Mr. J. Burtt Davy, Government Botanist, Union of South Africa, has kindly sent the following article on "Teff" in the Transvaal for publication in the *Kew Bulletin*. Former articles on this valuable grass have appeared in the *Bulletin* for 1887, No. 1, p. 2 ; and for 1894, p. 378.

The wonderful success which has attended the introduction of Teff into the Transvaal, has induced me to write an article in order to draw the attention of other Colonies to this remarkable grass. As it was Kew which introduced Teff to the civilised world, it is fitting that an account of it should appear in the *Kew Bulletin*.

Seed of Teff was obtained from Abyssinia in 1886 by the Royal Botanic Gardens, Kew, and was distributed to various Botanic Gardens and other Institutions in India and the Colonies, including Natal. As a result of this distribution the following reports were received :—

British Guiana :—It was reported to make "an excellent fine hay" and to mature in six or eight weeks from the time of sowing. "For this purpose Teff is well worth cultivating. It is cleaner and brighter-looking than any other grass, and is readily eaten by cattle and horses." (8.)

India :—In 1887 seed was given to the Rajah of Jashpore, and was reported upon favourably ; "the straw or grass is 4 or 4½ ft. in length and smells sweet. The hill people have taken a fancy to the crop" (6). Mr. J. F. Duthie wrote (16) :—"I have a bad

opinion of it as a food-grain, but think better of it as a fodder." Sown in March, the crop was cut in the beginning of May, but sprang up again into a second growth and yielded a cutting of green fodder early in the rains. Sown in July (the rainy season) and cut in the middle of August, the green crop weighed 16,000 lbs., or from 2000 to 3000 lbs. of dried hay, per acre. At a hill station (Arnigadh) "the hay made from the teff was of exceptional good quality and was greedily eaten by the garden bullocks. When it was offered to them they were being fed upon jowar (*i.e.*, kaffir corn) or sorghum stalks, and, as is well-known, these are remarkably sweet, and cattle, when fed upon them, generally refuse other kinds of dry food until they find that the sorghum is not forthcoming. Our garden cattle, however, seemed to prefer the teff-hay to sorghum, as they would not touch the latter until they had devoured the whole of the teff placed before them! The experience gained here during the last year in the cultivation of teff may therefore be summed up as follows :—

"When sown in the dry season it will yield a light crop of grain, and when sown in the rains it yields little or no grain, but produces abundance of green fodder, which may be cured into very palatable hay where the latter is preferred. In my opinion, teff is destined to become the rye-grass of India, and is well worthy of more extended trial on some of the Government fodder reserves" (16).

AUSTRALIA :—The reports were equally favourable, the value of this plant for fodder purposes being considered exceptionally high. Its chief merits in this respect are the short time it takes to mature and its suitability to thrive in dry, sandy regions, where few other grasses would flourish equally well (8).

NATAL :—Mr. J. Medley Wood, Director of the Natal Botanic Garden, Durban, reported in 1887 (4) as follows :—"I received from the Director of the Royal Gardens, Kew, a small bag of seeds of this plant, which is used in Abyssinia for making bread. The seed is very small, and it appeared to me that it would scarcely find favour in Natal as a cereal, though possibly in some parts of the Colony it might be found useful as a fodder plant. I therefore, after having the seed tested, and finding it quite good, distributed it in small packets to persons willing to give it a trial, and hope in "future report to be able to record the results." In 1888 he wrote (5) :—"This will, as I suspected, have no value as a cereal, in Natal, but very favourable reports have been received of it as a quick-growing fodder-grass." Again, in 1889 (15) :—"It was highly thought of as a quickly-growing grass, though as a cereal it proves, as I had suspected, to have no value in Natal. Whether or no the recipients of the seed have thought it of sufficient value to continue its cultivation, I have no information. De Schonburgk says that it stands drought well, and is a good grazing grass."

As a drought-resisting grain crop, for relieving a famine in India, the introduction of Teff does not appear to have been a success. This result and the details contained in the above reports, suggest the possibility that the Teff introduced was the variety known as *T'haf Tseddia*, the quick-growing, rainy-season sort, described by

the missionary Colbeaux (3) as "of very inferior quality, and the flabby cake, or the 'Tabita,' which is produced from its flour, is as disagreeable to chew as if it were mixed with sand.". The slow-growing, or *Thaf Hagaiz* variety, is described by the same writer as requiring nearly five months to mature, or two months longer than the other, and as being of superior quality for human food; "its flour is only advantageously used in making 'Tabita,' a kind of large fermented pancake. The 'Tabita' of Thaf is most easily digestible, and has none of the bitterness of some other kinds of grain."

But its failure as a grain-crop for India may be due entirely to other factors. The yields of grain where it was tried, appear to have been usually too small to be profitable. It should be borne in mind, moreover, that in the work of Seed and Plant Introduction and Acclimatisation, success rarely follows first attempts, whereas perseverance, repetition, study of controlling conditions and removal of inhibiting factors often result in subsequent success. The natural conservatism of native races should also be taken into account. A further cause of failure may have been the lack of a well-organised system of co-operation in field experiments on private farms. Observation and experience show that to overcome indifference or conservatism it is not sufficient to maintain demonstration plots on Government Farms or Experiment Stations, nor to issue publications broadcast, nor, even, to "stump the country" lecturing to farmers. New crops are generally taken up first by theorists or men trying to get rich quickly, to whom the advertisements of novelties in the seed-catalogues appeal; such men are often poor farmers and thus make a failure of what otherwise would be a success, the result being that the new crop gets a bad name.

Had I not adopted a system of co-operative experiments with the Transvaal farmers, by which selected farmers, who knew how to grow crops, were induced to try new and promising things, under supervision, Teff would not to-day have been the success that it is. In spite of the favourable reports quoted above it does not appear to have become established either in Australia or India. As already noted, it was introduced into Natal in 1887, and was distributed among twenty farmers, 17 in Natal, 2 in Zululand and one in the Transvaal; though it was reported in 1888 as being "highly thought of as a quickly-growing grass," it failed to acquire the status of a farm crop, and it was not until after its re-introduction in 1903, and by careful fostering, that it became established. But as Mr. Wentworth Sykes has pointed out (11) "it has now certainly come to stay, as witness the hundreds of tons of hay sold locally last year (1910) on the Johannesburg and Pretoria markets, which is but a little of that sold or fed locally."

In the *Bulletin* article on Tropical Fodder-grasses (8) it is stated (p. 375) that "In dry regions not suitable for permanent pastures, the Abyssinian Teff (*Eragrostis abyssinica*) might be grown during the occasional rains and made into hay. This grass will produce a heavy crop of hay in six weeks from the time of sowing. It is very nourishing, and cattle are very fond of it.'

About this time Kew very kindly sent me a little seed to California, where I grew it at the Experiment Station of the College of Agriculture. I was at once impressed with the wealth of hay produced.

But California is a region of winter rains, where Lucerne thrives to perfection, and where Lucerne is therefore the staple forage crop. No one who could grow Lucerne cared anything about putting in an annual hay crop, like Teff; and Lucerne being in the ascendant, no farmer had room or time for it.

When I came to the Transvaal in 1903 I brought with me seeds of the most successful grasses which I had grown at the Experiment Station there, such as Teff and New Zealand Tall-fescue (*Festuca arundinacea*). Most of these did well, and from the start Teff was a great success. In my Annual Report for the season 1903–4, dated 26th October, 1904, I wrote (9):

"Teff (*Eragrostis abyssinica*) is an annual grass of Abyssinia, leafy and fine in quality and 2 to 4 ft. high, seeding heavily; it makes very rapid growth, maturing in 7 or 8 weeks from time of sowing, and if cut before the seed develops, a second crop can be obtained from the same stand; it makes an excellent catch-crop for hay, two successive cuttings being obtainable during the summer on unirrigated land. The plants seed heavily, our yield of seed from a small plot having been at the rate of about $\frac{3}{4}$ of a ton (1500 lbs.) per acre; the seedlings are not readily scorched by the intense heat of summer, which is a most important point in this climate; its adaptability to our conditions is shown by the way in which 'volunteer' seedlings came up all over our Experiment Grounds, under the most adverse conditions. Stock eat this grass readily, both green and when made into hay. Teff is a most promising plant for further experiment. . . . Seed is now offered by French dealers at about 3*s*. 2*d*. per lb.; it weighs about 63 lbs. per bushel."

Seed harvested from this crop was distributed among selected farmers in different districts of the Transvaal, for trial under ordinary farm conditions and to test its adaptability to different parts of the country. My system was to issue the seed free of all cost to the farmer, who signed a written undertaking to return to me from his crop twice the amount of seed supplied. In the case of failure of his crop this condition was not enforced. The majority of *bona fide* farmers loyally carried out their agreement, and where they desired to retain all the seed for further experiment, they often offered to pay cash for it.

In my report for 1904–05 (p. 248) I wrote:—"Mr. V. L. Robertson, of Amersfoort, reports:—'In this grass [Teff] I think we have struck the desired hay for the High Veld; sown November 6th, it was 3 ft. high in February and ready for cutting for hay; if cut then it would have matured for a second crop of hay in April. Its yields of hay per acre must be tremendous. On account of the soft, thin straw, it dries and cures very quickly. Of all my experiments this has pleased me more than any.'

"The general consensus of opinion is that Teff is a most valuable hay-grass. Under favourable conditions it will mature in two

months from seed; the seed scatters easily and freely, readily producing a volunteer crop. The yield of seed is remarkable heavy [rendering it cheap and easily obtainable]. The fact that the farmers appreciate the crop is practically illustrated by the requests received for permission to retain, and pay cash for, Teff-seed which is due to the Department as a return for the seed originally supplied."

In February, 1905, my then Assistant, Mr. Hugh C. Sampson, B.Sc., writing in the *Transvaal Agricultural Journal* (Vol. iii, p. 547), noted that Teff sown at the Botanical Experiment Station on November 26th, 1904, was cut for seed on February 20th, twelve weeks from sowing, and gave a yield of 10,285 lbs. of green forage per acre, having had only 7·12 inches of rain during the growing period. "Though it has only been cut two days, the roots are already starting new growth for a second cutting."

In my Report for 1905–06 (p. 112) I noted that "out of twenty-two reported co-operative trials all but two were unqualified successes, and the failures were due to locusts and hail; farmers cannot speak too highly of this crop. One of them writes:—'This can no longer be looked upon as an experiment; its success is assured.' The consequent demand for seed is greater than the supply, owing to the fact that nowhere else than in Abyssinia has this become a commercial crop. By next season, however, I expect that all difficulty in this direction will have been overcome, as so much ground is being sown down to Teff this year."

In my Report for 1906–07 (p. 175) my Assistant at that time, Mr. H. Godfrey Mundy, reported that out of 28 co-operative experiments, carried out in all parts of the Transvaal, 21 were entirely successful; in one case a yield of 4 tons of hay per acre being reported. It was also highly spoken of, in several cases, as a smother-crop for weeds. A progressive farmer in the Wakerstroom District wrote: "It is a grand stand-by at the end of the winter and I don't expect to be without it in the future. All stock are fond of it and do well on it if cut before the straw gets strong. I am now selling seed." From the Ermelo District a farmer wrote: "I have grown Teff most successfully and have supplied farmers round about me with over 100 lbs. of seed free!"

During this period, the demand for seed almost exceeded the supply and the price ranged from 1*s.* up to 5*s.* per lb. With increased production, this fell to 9*d.*, 7*d.*, 6*d.*, 5*d.*, and finally 4*d.* During 1911 I had offers of seed from farmers which totalled over 100,000 lbs.; and this year (1912), one farmer alone has produced 60,000 lbs., which he is selling at 4*d.* per lb. in 100 lb. lots or 5*d.* retail.

But although Teff took with the progressive Transvaal farmer, from the start, the hay did not become a commercial article till some years later. As is usually the case with new farm crops, Teff hay did not sell well when first offered. But it was first grown for farm consumption, and only the surplus crop was put on the Johannesburg market. I well remember how disappointed I was at the reports of the earlier sales; they brought no more than ordinary rough veld-bedding, and were in fact bought for the same purpose! But that

was only because the townsman did not know anything about the new hay. Steps were taken to have trial lots tested by large consumers ; but to move a market requires either the whole-time energies of a shrewd business man or some fortuitous accident. I had other things to do, and could not act as Trades Commissioner for the introduction of Teff-hay on to the Johannesburg market! But the accident happened. As far as I can learn the details, they were as follows :—

A farmer having more Teff-hay than he required for the consumption of his stock, decided to sell the surplus, and sent it to the Johannesburg market. As stated above, it did not sell well ; none of the buyers knew the stuff, and it finally went for bedding. This was disappointing and I personally was afraid it might check the spread of the new crop. But I need not have been afraid. Evidently the low price paid the grower, for it was only his surplus, and his own use of the bulk of the crop doubtless paid him well, leaving the surplus for extra profit. He, and others, continued to send small lots, which were also bought for bedding. As bedding, Teff is softer than the ordinary bedding cut from vlei sedges and *Arundinella Eckloni*, and one lot was therefore selected by the buyer for a racing stable, as being superior to the ordinary. Rumour has it that the owner of the stable found that his racers ate their bedding in preference to the hay in their racks! Being an observant man, and realising that the price he had paid for the bedding was much lower than that of Lucerne hay or oat forage, he decided to buy more and feed it. To his surprise (the story goes) his horses not only ate all the Teff-hay, but began to put on condition ; then he bought up all that was put on the market and called for more. Others soon got wind of this, and the price rose. It was not long before it had risen from 1*s*. per bale or £1 per ton till it commanded the same price as Lucerne hay, *i.e.*, 7*s*. 6*d*. per 100 lbs. or £7 10*s*. per Colonial ton.

Once a market was established, the production went up by leaps and bounds ; the markets were soon flooded, and the price fell to a normal figure ; but by this time farmers had learned the value of Teff-hay for consumption on their own farms, and when it did not pay to rail it to market, they fed it. Two years ago I never again expected to see Teff reach a high figure, but the unprecedented drought of the winter of 1912, following a season in which the rainfall (in Pretoria) was 7 inches below the average, has raised the price of hay and fodder so that Teff has again been selling at £7 10*s*. per ton in Johannesburg.

Since the Union of the four South African Colonies, I have distributed seed to the other Provinces of the Union, and am glad to find that it is taking hold in the Orange Free State, Natal and the Eastern Province. A good deal of seed has been sold by Transvaal farmers to Rhodesia, and some to Nyasaland, British East Africa, German South-West Africa, the Congo State, and Portuguese East Africa, so there is reason to expect that Teff will, ere long, become a staple hay-crop throughout civilized Africa.

Composition.—Analyses of Teff-hay made by Herbert Ingle, F.I.C., late Chief Chemist of the Transvaal Department of

Agriculture, show (14) that Teff-hay has as well-balanced an albuminoid ration as oat-hay. The following comparison is made from the figures supplied in Mr. Ingle's Report :—

—	Teff-hay.		Oat-hay.	Boer Manna.		Lucerne hay.
	A.	B.		A.	B.	
Moisture	8·88	9·16	8·00	8·25	6·54	7·97
Ash	5·55	6·71	4·23	7·78	6·06	8·94
Protein	6·21	4·72	5·65	5·00	4·90	15·49
Soluble Carbohydrates ...	39·08	42·71	44·04	46·24	38·93	30·58
Ether Extract	1·21	1·07	3·87	1·88	1·07	2·36
Crude fibre	39·07	35·63	34·22	30·85	42·50	34·76
	100·00	100 00	100·00	100·00	100·00	100·00
Albuminoid ratio :						
Conventional	1:6·8	1:9·6	1:9·4	1 10·1	1:8·5	1:2·3
Suggested	1:12·8	1:16·8	1:14·5	1:15 8	1:16·8	1:4·4
The ash included :						
Silica	3·25	4·08	2·01	5·67	2·44	0·49
Potash	1·28	1·62	—	—	2·30	3·61
Lime	0·30	0·27	0·18	0·30	0·21	1·38
Phosphorus pentoxide ...	0·24	0·28	0·34	0·32	0 09	0·32
Ratio of lime to 100 of phosphorus pentoxide.	125	96	53	94	217	431

The grain of Teff (Red) has been analysed by Professor Sir A. H. Church (3), whose report is as follows :—

	In 100 parts.
Water	15·2
Albuminoids	8·2
Starch, &c.	68·1
Oil	2·8
Cellulose, &c.	2·8
Ash	2·9
	100·0

"The ratio between the albuminoids, or flesh formers, and the heat-givers, or force producers (calculated as starch) is here 1 : 9. This ratio is less satisfactory than that of the majority of millets, but is near that of *Panicum miliare*" (common or broom-corn millet).

Teff has raised scores of small Transvaal farmers from poverty to comparative comfort, and has been largely instrumental in putting the dairy industry of the Witwatersrand on its feet. The opinion has been expressed by our farmers that "if the Division of Botany of the Department of Agriculture had done nothing else, the introduction and establishment of Teff as a farm-crop would have more than paid South Africa the whole cost of the Division for the ten years of its existence."

The chief value of Teff as a hay crop lies in its palatability, high nutritive value, narrow albuminoid ratio (for a grass-hay), heavy yield, rapid growth, and drought-resistance. My experience with Teff in the Transvaal is that if sown in October (provided we have fairly good rains to establish the braird), we can obtain a cutting of

about a ton of hay per acre by the first week of the New Year ; at this time we often have 10 days to 2 weeks free from rain, which allows farmers to harvest the crop nicely. Our steady rains usually begin about the middle of January ; these induce the Teff to start fresh growth, which continues till the dry weather begins in March ; by this time another hay crop of 1 to 1½ tons per acre can be cut and cured. Light showers usually occur in March, enabling the Teff crop to make an aftermath which furnishes good pasturage until it is killed by frost.

References.

(1) Richard : Tentamen Florae Abyssinicae, vol. ii, p. 429 (1851) ; quoted in (3).

(2) Bruce : Travels to Discover the Source of the Nile, vol. vii, pp. 184–6 ; quoted in (3).

(3) Teff : in Kew Bulletin 1887, No. 1, pp. 2-6.

(4) Medley Wood, J. : Natal Botanic Gardens, Durban, Annual Report, 1887.

(5) Medley Wood, J. : Natal Botanic Gardens, Durban, Annual Report, 1888.

(6) Agri.-Hort. Society of India, Proceedings, 1888, p. lxxii.

(8) Tropical Fodder Grasses : in Kew Bulletin 1894, pp. 378–380.

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IV.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECADES LXX—LXXI.

5185 691. **Thalictrum Purdomii**, *J. J. Clark* [Ranunculaceae - Anemoneae] ; species *T. minori*, L., valde affinis sed pedicellis subcapillaribus longioribus, floribus majoribus, sepalis acutis vel acuminatis.

Herba ramis sulcatis rubro-viridibus fistulosis glabris. *Folia* tri- vel bi- pinnata, ambitu ovata, ad 20 cm. longa, ad 15 cm. lata,

pinnis 3–5-jugis inferioribus ad 15 cm. longis, pinnulis circiter 3-jugis ; foliola ovata, trilobata, lobo intermedio plerumque acute vel subacute tridentato, basi rotundata, glabra, membranacea, subtus subglauca ; petioli breves, uti rhachis angulato-striati ; petioluli ultimi ordinis breves vel brevissimi, raro ad 3 mm. longi ; stipulae petioli basi adnatae, perlatae, simplices, parvae. *Flores* in paniculam inferne foliatam laxam dispositi, parvi, virescentes, penduli ; bracteae ad basin pedicelli subulatae, breves ; pedicelli subcapillares, valde inaequales, longiores ad 15 mm. longis. *Sepala* 4, ovato-lanceolata, 4·5 mm. longa, acuta vel acuminata, 3-nervia. *Stamina* circa 14 ; antherae lineares, apiculatae, 3 mm. longae ; filamenta filiformia ad 2 mm. longa. *Carpella 5*, sessilia, longitudinaliter 8-costata ; stigmata triangularia. *Achaenia* oblique oblonga, teretia, costis acutis lateralibus dorsali proximis quam ceteris minus altis, 3·5 mm. longa stigmate dempto.

N. China. *Purdom*, 169.

The plant described was grown by Messrs. Veitch & Sons at Langley nursery from seeds collected by Mr. W. Purdom in N. China.

692. **Onobrychis (Hymenobrychis) Sykesiae**, *N. D. Simpson* [Leguminosae-Hedysareae] ; affinis *O. vaginali*, C. A. Mey., sed petiolis longioribus, dentibus calycinis longioribus, vexillo breviore, alis parvis obtusis auricula obtusa parva, carina paulo longiore distincta.

Herba radice funiculari, caulescens, ultra 25 cm. alta, pilis longis tenuissimis patulis sericeis laxe vestita. *Folia* ad 10 cm. longa, 4–8-juga ; foliola late ovata, elliptica vel obovata, obtusa, minute mucronata, ad 18 mm. longa, 12 mm. lata, supra glabra, subtus pilis tenuissimis longis sericeis laxe villosa ; petiolus ad 5 cm. longus ; stipulae subherbaceae, late lanceolatae, acuminatae, basi connatae, intus glabrae, extus molliter sericeo-villosae. *Racemi* albido-sericei, multiflori ; flores primum dense congesti, deinde laxi ; bracteae lineares, acuminatae, 6 mm. longae ; pedicelli 1–3 mm. longi ; bracteolae filiformes, 1·5 mm. longae. *Calyx* campanulatus, 4 mm. longus, pilis longis sericeis vestitus, dentibus anguste linearibus, ad 9 mm. longis, infero carinam aequante. *Corollae* vexillum obovatum, bilobum, 1·4 cm. longum, 9 mm. latum, sicco ochroleucum, nervis distinctis atropurpureis longitudinaliter striatum, extus laxe villosulum ; alae glabrae, obtusae, 5 mm. longae, 2·6 mm. latae, margine superiore 1 mm. infra apicem unidentata, auricula obtusa brevi deorsum directa ; carina 1·3 cm. longa, 6 mm. lata, obtusa, auricula parva, ungue 4 mm. longo. *Ovarium* glabrum biovulatum ; stigma nudum, parvum.

Persia. Khorasan, *Sykes*, 110.

693. **Astragalus (Cercidothrix) Sykesiae**, *N. D. Simpson* [Leguminosae-Galegeae] ; potius ad *A. Holdichianum*, Ait. et Baker et *A. Cuscutae*, Bge., accedens, sed foliis 3–5-jugis, foliolis fere orbicularibus, pedunculis folia non excedentibus, vexillo margine integro breviore et carina angustiore, ovario subsessili 34-ovulato.

Herba perennis, rhizomate funiculari descendente parce ramoso, acaulis, caespitosa, pube cana adpressa medio fixa vestita. *Folia* basi congesta, imparipinnata, 3–7-juga, ad 10 cm. petiolis inclusis

longa ; petioli ad 4 cm. longi, basibus persistentibus ; foliola obovato-orbicularia, brevissime petiolulata, obtusissima vel minute mucronulata, majora ad 1·3 cm. longa et 1·1 cm. lata, utrinque pilis albis adpressis dense vestita ; stipulae imbricatae, triangulares, acutae, ad 6–7 mm. longae, subtus pilis longis dense vestitae, supra glabrescentes. *Racemi* laxi, 4–5-flori, pedunculis 4–8 cm. longis ; bracteae ascendentes, 3 mm. longae ; bracteolae 2, calycem subtendentes. *Calyx* tubulosus, 1·2–1·5 cm. longus, viridis, nervis primariis purpurascentibus, pilis albis adpressis vestitus, dentibus lanceolatis acutis 3·5 mm. longis. *Corolla* calyce sesquilongior, sicco lutea, apice atropurpurea ; vexillum late elliptico-oblongum, 2·4 cm. longum, 1·9 cm. latum, abrupte in unguem angustum 4–5 mm. longum contractum, margine integro, glabrum, alas paullo superans ; alae liberae, 2·2 cm. longae, 6 mm. latae ; lamina superne rotundato-obovata, inferne obtuse auriculata, ad 1 cm. longa ; carina 1·9 cm. longa, apice obtusa, subemarginata. *Ovarium* subsessile, pilosum, 34-ovulatum ; stigma nudum, minute capitatum.

PERSIA. Khorasan, *Sykes*, 112.

694. **Flemingia angusta**, *Craib* [Leguminosae-Phaseoleae] ; ob foliola longiuscula, angusta, racemos petiolos subaequantes vel paulo superantes distincta.

Ramuli glabri vel subglabri, cortice pallide brunneo striato inconspicue pauci-lenticellato obtecti, ad 3 mm. diametro. *Folia* trifoliolata, petiolo communi alato dorso bisulcato 5·3–6·3 cm. longo parce pubescente suffulta ; stipulae deciduae ; foliola anguste lanceolata, apice attenuata, acuta, basi terminalia aequaliter cuneata, lateralia inaequaliter cuneata, ad 22·5 cm. longa et 3·2 cm. lata, chartacea, supra glabra, subtus pallidiora, glandulosa, nervis tantum parcissime adpresse pilosula, nervis lateralibus utrinque ad 11 supra cum costa conspicuis subtus prominentibus, nervis transversis subtus prominulis ; petioluli inter se subaequales, circiter 4 mm. longi, validiusculi, plus minusve adpresse pubescentes. *Racemi* axillares, petiolos demum parum superantes, subsessiles ; bracteae deciduae, lanceolatae, acutae, 5–6 mm. longae, distincte nervatae, ciliatae. *Calycis* tubus circiter 2 mm. longus, lobi superiores lateralesque lanceolati, acuti, ad 3 mm. longi et 1 mm. lati, lobus inferior lineari-lanceolatus, acutus, 4·5 mm. longus. *Vexilli* lamina 5·5 mm. diametro, basi auriculata, ungui 1·5 mm. longo ; alae 3·5 mm. longae, 1·25 mm. latae, ungui 1·5 mm. longo ; carina 5 mm. longa, ungui circiter 2 mm. longo. *Ovarium* 1·5 mm. altum, glabrum ; stylus medio incrassatus, glaber. *Legumen* vix maturum, circiter 1 cm. longum.

INDO-CHINA. Burma : Tharrawaddy, Kangyi Reserve, 21 m., *Lace*, 5858 (type) ; Pegu River, *McClelland* ; Henzada, *Shaik Mokim*, 1345.

695. **Flemingia Lacei**, *Craib* [Leguminosae-Phaseoleae] ; a *F. involucrata*, Benth., capitulis conspicue pedunculatis, floribus conspicuis, calycis brevioris lobis haud dense longe ciliatis facile distinguenda.

Fruticulus 30–60 cm. altus (ex *Lace*) ; caules primo albido-pubescentes parceque glandulosi, mox subscabridi, ad 5 mm. diametro. *Folia* trifoliolata, petiolo 1·6–3·7 cm. longo supra

conspicue canaliculato parce pubescente glandulosoque plus minusve glabrescente suffulta ; stipulae deciduae, oblongo-lanceolatae, acute acuminatae, fere 1·5 cm. longae et 5 mm. latae, utrinque pubescentes, ciliatae ; foliola foliorum superiorum plerumque late lanceolata, acutiuscula, inferiorum suborbicularia, apice rotundata, basi terminalia late cuneata, truncata, lateralia obliqua, latere altero cuneata, altero rotundata, 4·5–6 cm. longa, 2–5·4 cm. lata, firme chartacea, supra primo puberula, mox glabra, infra glandulosa, costa nervisque parce pubescentia, ciliata, nervis lateralibus utrinque 7–9 supra conspicuis subtus prominentibus ; petioluli 2–3 mm. longi, pubescentes ; stipellae vix 2 mm. longae. *Inflorescentia* e capitulis et axillaribus et terminalibus pauciflоris ad 4 cm. diametro constituta ; pedunculus communis 1·4–1·8 cm. longus, albo-pubescens parceque glandulosus ; bracteae involucrantes circiter 6, ovatae, acute acuminatae, circiter 1 cm. longae et 5·5 mm. latae, dorso tenuiter pubescentes, ciliatae, intra inferne praecipue tenuiter albo-pubescentes ; pedicelli brevissimi. *Calycis* tubus 4 mm. longus, extra pilis longis albidis instructus, intra ut lobi adpresse albo-pubescens ; lobi 5, lanceolati vel late lanceolati, acuti, ad 1 cm. longi et 4 mm. lati, extra pilis albidis basi tuberculatis instructi, ciliati. *Vexilli* lamina 1·5 cm. longa et 1·9 cm. lata, basi auriculata, in unguem 7 mm. longum et 4 mm. latum contracta, extra parce brevius pubescens glandulosaque, intra glabra ; alae lamina ad 1·1 cm. longa et 6 mm. lata, ungui circiter 9 mm. longo ; carina circiter 9 mm. longa, ungui ad 1 cm. longo suffulta. *Ovarium* circiter 2 mm. altum, densius albo-pilosum ; stylus inferne filiformis, circiter 5 mm. e basi subito ad 1 mm. expansus, apice infra barbatus. *Legumen* 7 mm. longum, 3 mm. diametro, tenuiter pilosum, monospermum ; semina nigra, ambitu oblonga, 4 mm. longa, 2·25 mm. diametro.

Indo-China. Upper Burma : Maymyo Plateau, on stony hills, 1050 m., *Lace*, 5956.

696. **Dissochaete acmura,** *Stapf & M. L. Green* [Melastomaceae]; affinis *D. annulatae*, Hook. f., et *D. Cummingii*, Naud., ab illa indumento subtiliore, bracteis staminibusque minoribus, ab hac floribus majoribus distincta.

Planta scandens ; rami teretes, juniores et folia (subtus) et inflorescentia pilis stellatis rufo-furfuraceo-tomentella. *Folia* ovata vel oblonga, superne longe attenuata, tunc caudato-acuminata, basi rotundata vel subcordata, 11–13 cm. longa, 4–5 cm. lata, membranacea, supra glabra, 5-plinervia vel fere 5-nervia, nervis supra insculptis ; petiolus ad 1 cm. longus. *Inflorescentiae* axillares terminalesque in thyrsum laxum foliatum collectae, inferiores paniculatae, tandem ad 8 cm. longae, superiores ad cymas trifloras vel bifloras reductae : pedicelli 5–7 mm. longi ; bracteae citissime caducae, summae tantum visae lineares, 3 mm. longae. *Calyx* 0·9–1 cm. longus, subtruncatus, ferrugineo - tomentosus, tubo oblongo-campanulato. *Petala* obovata, ad 2 cm. longa, 1·25 cm. lata. *Stamina* 8 ; filamenta 1–1·1 cm. longa ; antherae 4 majores, curvatae, 1–1·2 cm. longae, connectivo basi producto ad 5 mm. longo, appendicibus anticis 1–2 mm. longis, posticis 0·5 mm. longis ; antherae 4 minores ad 1·2 cm. longae, connectivo non producto,

appendicibus anticis 3–4 mm. longis, posticis 0·5 mm. longis. *Stylus* 1 cm. longus. *Fructus* submaturi ad 1·2 cm. longi, ad 6 mm. lati.

PHILIPPINE ISLANDS. Luzon: Jayabas Province, *Cumming*, 815, 2840; Albany Province, *Cumming*, 2838.

697. **Agapetes Lacei**, *Craib* [Vacciniaceae - Thibaudieae]; ab *A. obovata*, Hook. f., corolla quadruplo longiore, ab *A. mitrarioide*, Hook. f. et *A. buxifolia*, Nutt., foliis minoribus nervis supra obscuris, corollae lobis majoribus recedit.

Ramuli setis ascendentibus instructi. *Folia* plus minusve elliptica, apice acuta vel obtusa, basi cuneata vel rotundata, 0·7–1·5 cm. longa, 6–8 mm. lata, coriacea, glabra, margine superne serrulata, nervis lateralibus utrinque circiter 5 subtus plerumque conspicuis supra omnino obscuris, petiolo circiter 1 mm. longo supra minute puberulo suffulta. *Flores* solitarii; pedicelli 1·5–1·8 cm. longi, puberuli praetereaque pilis albis divergentibus glandulosis hic illic instructi. *Receptaculum* 4 mm. longum, 3·5 mm. diametro, puberulum. *Calyx* 4 mm. longus; lobi deltoidei, acuti, 2·75 mm. longi, 2·5 mm. lati, conspicue nervati. *Corollae* tubus 2 cm. longitudine paullulo excedens, lobi deltoidei, acutiusculi, 8 mm. longi, 5·5 mm. lati. *Filamenta* circiter 1·5 cm. longa; antherae conniventes, 1·6 cm. longae, basi apiculatae, dorso haud calcaratae.

INDO-CHINA. Burma: Bhamo; Lapyeka to Sinlum Kaba, 1500 m., *Lace*, 5771.

698. **Agapetes oblonga**, *Craib* [Vacciniaceae - Thibaudieae]; ob ramulos longe setosos receptaculaque longe dense hirsuta distincta.

Ramuli setis divergentibus circiter 4 mm. longis densius instructi, cortice pallido. *Folia* oblonga vel oblongo-lanceolata, apice acuta, basi truncata, 3·5–6 cm. longa, 1–1·9 cm. lata, chartaceo-coriacea, glabra, margine apice tantum serrulata vel interdum inferne obsolete serrulata, nervis lateralibus utrinque circiter 9 cum nervis transversis pagina utraque conspicuis, petiolo valido 1–1·5 mm. longo suffulta. *Corymbi* 2–3-flori, sessiles vel subsessiles; pedicelli ad 1·2 cm. longi, apice articulati, plerumque superne puberuli sed etiam interdum setis parce instructi. *Receptaculum* 2·5 mm. altum, ad 2·5 mm. diametro, longe dense hirsutum. *Calyx* 3·5 mm. altus; lobi vix 2 mm. longi, 1·75 mm. lati. *Corollae* tubus 1·9 cm. longus, lobi deltoidei, obtusiusculi, 1·5 mm. longi, vix 2·5 mm. lati. *Filamenta* 1·2 cm. longa; antherae 8 mm. longae, dorso breviter bicalcaratae.

INDO-CHINA. Burma: Bhamo; Lapyeka to Sinlum Kaba, 1500 m., *Lace* 5772.

699. **Dionysia Lamingtonii**, *Stapf* [Primulaceae]; affinis *D. Michauxii*, Boiss., affinis, sed calyce minus alte fisso, corollae tubo os versus paulum dilatato caeterum angustissime cylindraceo, staminibus alte insertis distincta.

Herba compacte pulvinaris, ramis vetustis diu foliis emarcidis vestitis, junioribus apice rosulam viridem 2·5–3 mm. diametro gerentibus. *Folia* plana, spathulato-oblonga, acutiuscula vel subobtusa, integra, 2·5–3 mm. longa, vix ad 1 mm. lata, inferne hyalino-membranacea, parte dilatata herbacea albo-pilosa flabellatim

nervosa. *Flores* solitarii. *Calyx* ultra medium 5-partitus, 3 mm. longus, parce pilosulus, segmentis oblongis obtusis. *Corolla* aurea, tubo filiformiter-cylindraceo inferne parcissime glanduloso caeterum glabro 1·2 cm. longo os versus paulo ampliatus ; lobi obovati, retusi, 3 mm. longi. *Antherae* summo tubo insertae. *Stylus* cum stigmate 7 mm. longus.

South-west Persia. Bahtian (?), 1200–1800 m., *Lord Lamington*.

700. **Wightia Aplinii**, *Craib* [Scrophulariaceae - Cheloneae] ; a *W. gigantea*, Wall., foliis supra molliter breviter stellato-pubescentibus, thyrsis brevioribus, floribus congestis, staminibus longe exsertis distinguenda.

Ramuli primo breviter albido-stellato-tomentelli, mox glabri, cortice fusco-brunneo parce lenticellato obtecti. *Folia* ovato-elliptica, apice acuminata, obtusa, basi truncata vel subcordata, 7·5–15 cm. longa, 5·4–9 cm. lata, coriacea, supra ob pilos albidos stellatos paucos mollia, subtus densius albido-tomentella, nervis lateralibus utrinque 4–5 pagina superiore leviter immersis inferiore prominentibus, nervis transversis supra obscuris vel subobscuris subtus prominulis, petiolo valido ad 2 cm. longo albido-stellato-tomentello suffulta. *Thyrsi* axillares, ad 7 cm. longi, 3–4 cm. diametro, pedunculo communi ad 3 cm. longo suffulti. *Calycis* tubus 5 mm. longus, apice 8 mm. diametro, lobi apice rotundati, 3 mm. longi, 3·5 mm. lati. *Corollae* tubus 1·45 cm. longus, basi 4 mm., apice 1·1 cm. diametro, lobus anticus oblongus, obtusus, 7 mm. longus, 5 mm. latus, lobi laterales apice rotundati, 5 mm. longi, 8 mm. lati, duo postici in unum bifidum connatum, 8 mm. longi ; corolla extra stellato-tomentella, intra staminum insertionem circa pilosa. *Filamenta* longiora 3·7 cm. longa, breviora 3·2 cm. longa. *Ovarium* 3 mm. altum, 3 mm. diametro, glabrum ; stylus 3·8 cm. longus.—*W. gigantea*, Coll. et Hemsl. in Journ. Linn. Soc., vol. xxviii. p. 99, *vix* Wallich.

Indo-China. Upper Burma : Shan States ; hill east of Tapet, 1200 m., *Aplin*.

701. **Loranthus Robertsonii**, *Gamble* [Loranthaceae-Lorantheae]; species *L. ferrugineo*, Roxb., affinis, foliis majoribus coriaceis ovatis cordatis glabris irregulariter nervosis et inflorescentia lanugine aurea molli densissime obtecta differt.

Frutex parasiticus, ad 1 m. altus, ramulis fulvis teretibus parce tomentosis strictis. *Folia* coriacea, subopposita, ovata, apice obtusa, basi paullo cordata, glabra, 10–13 cm. longa, 6–8 cm. lata, costa crassa, nervis utrinque circa 6 irregularibus cito ramosis et in medio laminis anastomosantibus, nervulis transversis paucis irregularibus ; petiolus crassus, 5 mm. longus. *Flores* in cymis paucifloris axillaribus fasciculatis lanugine fulvo-aurea molli densissime obtectis ; cymae 1–2 cm. longae, 4–5-florae ; pedunculus gracilis, vix 1 cm. longus ; pedicelli 4 mm. longi ; bractea parva, obtusa, inconspicua. *Calycis* tubus 3 mm. longus, cupularis, limbo brevi inconspicuo. *Corollae* tubus in alabastro clavatus, 1·5–1·6 cm. longus, florens uno latere fere ad basim fissus, infra lobos constrictus ; lobi 4 patentes, acuti, 6–8 mm. longi, intus glabri. *Stamina* 4, linearia, 2 mm. longa ut etiam filamenta. *Ovarium* ovoideum, stylo gracili geniculato, stigmate parvo capitato. *Fructus* non visus.

INDO-CHINA. Upper Burma: near Mawkmai; in dry scrub jungle, parasitic on trees, 750 m., *W. A. Robertson*, 219, Jan. 22, 1911.

702. **Elytranthe papillosa**, *Gamble* [Loranthaceae-Lorantheae]; species distincta *E. retusae*, G. Don, affinis, foliis minoribus oblanceolatis, racemis bifloris et calycis tubo et corollae lobis extus prominenter papillosis differt.

Frutex parasiticus, ramulis teretibus scabris siccitate pallide brunneis. *Folia* coriacea, opposita, oblanceolata, apice rotundata, basi cuneata, siccitate utrinque opaca, olivacea, 3–4 cm. longa, circa 1·5 cm. lata, costa gracili inconspicua, nervis utrinque 1–2, pare infimo e basi ad apicem producto, supero paullo altius orto breviore vel nullo, omnibus perobliquis, reticulatione obscura; petiolus nullus vel vix 3 mm. longus. *Flores* flavo-aurantiaci, in racemis 1–2-floris axillaribus pedunculatis; pedunculus circa 1 mm. longus, ut etiam pedicelli; bractea parva, ovata, acuta; bracteolae minutae, labium bilobum formantes. *Calycis* tubus ovoideus, 2 mm. longus, prominenter papillosus, limbo subnullo. *Corollae* tubus glaber, in alabastro cylindricus, supra 6-angulatus, florens infundibuliformis, 7–8 mm. longus; lobi 6, extus prominenter papillosi, spatulati, recurvi, 5–6 mm. longi. *Stamina* 6, antheris oblongis 1·5 mm. longis, filamentis gracilibus 5 mm. longis. *Ovarium* ovoideum, stylo gracili, stigmate capitato. *Fructus* non visus.

MALAY PENINSULA. Singapore: Kranji, *Ridley*, 2045, Feb. 1891.

703. **Elytranthe Barnesii**, *Gamble* [Loranthaceae-Lorantheae]; *E. globosae*, G. Don, affinis, foliis oblongo-lanceolatis, ramulis praecipue ad nodos crassis, racemis brevioribus magis fasciculatis differt.

Frutex parasiticus, glaber, ramulis praecipue ad nodos crassis, cortice aspero. *Folia* coriacea, opposita, lanceolata vel oblongo-lanceolata, apice obtuse acuminata, basi rotundata et saepe inaequalia, marginibus recurvis, 6–12 cm. longa, 2·5–4·5 cm. lata, supra lucida, infra opaca, siccitate olivacea, costa supra et infra prominente, nervis utrinque 7–9 fere angulo recto e costa ortis prope marginem curvatis, reticulatione obscura; petiolus crassus, 5–7 mm. longus. *Flores* in racemis 4–5-floris glabris circiter 12–15 mm. longis plerisque simul ad nodos incrassatos fasciculatis ex axillis foliorum ortis vel subterminalibus; pedicelli graciles, 1·5–2 mm. longi; bractea et bracteolae ovato-acutae, fere liberae. *Calycis* tubus ovoideus, sulcatus, limbo 1 mm. longo truncato. *Corolla* in alabastro clavata, angulata, 8 mm. longa; lobi 6, lineares, acuti, e medio reflexi. *Stamina* 6; antherae oblongae, 1·25 mm. longae; filamenta 3·5 mm. longa. *Ovarium* ovoideum, stylo gracili paullo angulato, stigmate obtuso vel emarginato. *Fructus* ignotus.

MALAY PENINSULA. Pahang: Kluang Terbang, *W. D. Barnes*, 10,905.

704. **Elytranthe Robinsonii**, *Gamble* [Loranthaceae-Lorantheae]; species distincta, *E. Lowii*, Gamble (*Loranthus Lowii*, King), affinis, racemis corollaque minoribus et pedicellis glabris differt.

Frutex parasiticus, glaber, ramulis gracilibus, cortice griseo-brunneo, ultimis paullo angulatis. *Folia* coriacea, opposita vel subopposita, anguste lanceolata, apice et basi acuminata, 5–8 cm. longa, 1·25 cm. lata, supra rubra, infra viridia, siccitate supra olivacea, infra ferruginea, costa gracili pagina utraque prominente, nervis utrinque 3–5 vix distinctis irregularibus perobliquis, reticulatione obscura ; petiolus 3–4 mm. longus, utroque latere marginatus. *Flores* parvi, aurantiaco-rubri, in fasciculis subsessilibus racemorum flores 1–3 gerentium vix 5 mm. longorum ex axillis foliorum vel foliorum delapsorum ortis ; pedicelli brevissimi ; bractea ovata, acuta ; bracteolae in cupulam bilabiatam junctae. *Calycis* tubus ovoideus, 2 mm. longus, limbo truncato plano vel minuto lobato. *Corolla* in alabastro clavata, 5–6 mm. longa, infra lobos 6-angulata ; lobi 6, lineari-lanceolati, tubum aequantes. *Stamina* 6, antheris minimis 0·5 mm. longis et filamento 1·5 mm. longo. *Ovarium* ovoideum, stylo gracili, stigmate parvo obtuso. *Fructus* ignotus.—*Loranthus globosus*, Ridley in Journ. Linn. Soc. xxxviii. 321, non Roxb.

Malay Peninsula. Pahang: on Gunong Tahan, 1200–1500 m., *Wray and Robinson*, 5404, June 1905.

705. **Elytranthe Wrayi**, *Gamble* [Loranthaceae-Lorantheae]; species *E. loniceroidi*, G. Don, affinis, pedunculis bifloris subsessilibus et tubo corollae longiore differt.

Frutex parasiticus, ramulis validis teretibus pallide brunneis, ad nodos tumidis. *Folia* crasse coriacea, opposita, oblongo-lanceolata, apice obtusa, obtuse acuta vel aliquando obtuse acuminata, basi attenuata et saepe inaequalia, 10–13 cm. longa, 3–7 cm. lata, utrinque laevia, siccitate olivacea, costa crassa, nervis utrinque 5–6 irregularibus obliquis, reticulatione subobscura ; petiolus 0–10 mm. longus, laminis marginibus decurrentibus ampliatus. *Flores* bini, ad excavationes pedunculi brevis axillaris positi ; flos uterque bractea lata ovata horizontali 3–5 mm. longa suffultus ; bracteolae in cupulam crassam truncatam 3 mm. longam margine exteriore fissam connatae ; pedunculus crassus, 3 mm. longus. *Calycis* tubus laevis, cylindricus, 3–4 mm. longus, limbo cylindrico truncato 4–6 mm. longo. *Corollae* tubus ruber, infra lobos viridescens, curvatus, tubulosus, infra lobos inflatus et sexangularis, 4–5 cm. longus ; lobi 6, flavi, ad margines rubri, lineari-lanceolati, apice acuti, florentes torti et reflexi, 1·5–2 cm. longi. *Stamina* 6, antheris linearibus apice acutis basi paullo calcaratis 7–8 mm. longis, filamentis aequilongis. *Ovarium* breviter cylindricum, stylo gracili geniculato, stigmate oblique capitato. *Fructus* non visus.

Malay Peninsula. Upper Perak, 300 m., *Wray*, 4770.

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706. **Viscum costatum**, *Gamble* [Loranthaceae-Visceae]; *V. albo*, Linn., affinis, ramulis crassis longitudinaliter rugosis, foliis eximie 5-costatis differt.

Frutex parasiticus, ramulis dichotomis crassis longitudinaliter sinuatim rugose striatis, nodis multum incrassatis. *Folia* coriacea, opposita, sessilia, obovata, apice rotundata, basi cuneata, 2·5–4·5 cm. longa, 1-2 cm. lata, siccitate fere nigra, marginibus recurvis, costis 5 conspicuis, exterioribus apicem versus incurvis, nervis e costis paucis curvatis, reticulatione obscura. *Flores* in axillis ramulorum plerumque 3, bractea cymbiformi lata suffulti ; ♂ ignotus ;

♀ rugosus, perianthii lobis deciduis. *Bacca* (immatura) ovoidea, rugosa, apice conico terminata.

North-East Himalaya. Darjeeling: on trees at over 2000 m. alt., *Gamble* 711, June 1876.

707. **Viscum Wrayi**, *King ex Gamble* [Loranthaceae-Visceae]; *V. orientali*, Willd., affinis, internodiis ramulorum alternatim complanatis, foliis magis coriaceis obovatis, bacca laevi nec pustulata differt.

Frutex parasiticus, ramulis crassis dichotomis vel oppositis teretibus, ultimis plus minusve alternatim complanatis ad nodos parce incrassatis. *Folia* opposita, crasse carnoso-coriacea, obovata, apice rotundata vel paullo emarginata, basi cuneata, 3–4·5 cm. longa, 1–3 cm. lata, luteo-viridia, siccitate fere nigra, glabra, infra lucida, marginibus recurvis, costis 5, exterioribus pedatis, infra ut nervis vix manifestis, reticulatione obscura; petiolus 0. *Flores* 1–3 in fasciculis axillaribus breviter pedunculatis, bracteolis 2 ovatis connatis involucrum formantibus; flos intermedius ♀, pedicello 1 mm. longo; 2 exteriores ♂, sessiles. *Perianthii* lobi 4, ovati, acuti, circiter 1 mm. longi. *Stamina* 4, circa 6–7-porosa, poris circularibus. *Ovarium* oblongum, apice truncatum, stigmate conoideo. *Bacca* ovoidea, pallide viridis, laevis, 5 mm. diametro. *Semen* ellipsoideum, embryone obliquo.

Malay Peninsula. Kedah: on Kedah Peak, *Ridley*, 5847. Perak: at lower camp, Gunong Batu Pateh, *Wray*, 1111.

708. **Viscum flexuosum**, *King ex Gamble* [Loranthaceae-Visceae]; *V. articulato*, Burm., affinis, articulis ramulorum pergracilibus 2 mm. latis vix complanatis, bacca 2·5 mm. diametro differt.

Frutex parasiticus, pendulus, foliis carens; ramuli crebre di-vel tri-chotome divisi, teretes, graciles, articulis vix complanatis linearibus 1·5–2·5 cm. longis 2 mm. latis; articuli alternatim torti. *Flores* minuti, axillares, plerumque utrinque 3, bracteis 2 connatis suffulti; flos intermedius plerunque ♀, bibracteolatus; 2 exteriores ♂ vel ♀. *Perianthii* lobi 3–4, minutissimi, in ♀ 0·25 mm. longi, in ♂ minores, erecti, decidui. *Stamina* perianthii lobis adnata, poris minutissimis. *Ovarium* ovoideum, laeve, truncatum, stigmate parvo rotundato. *Bacca* alba, globosa, 2·5 mm. diametro.

Malay Peninsula. Singapore: *King's Collector*, 1187; at Tanglin etc., *Ridley*, 6018, 8912, *Murton*, 151.

709. **Henslowia Collettii**, *Gamble* [Santalaceae-Osyrideae]; species insignis, *H. sessili*, Craib, affinis, foliis multicostatis et floribus fructibusque pedicellatis recedit.

Frutex parasiticus, circa 1 m. altus, ramulis glabris gracilibus, cortice brunneo lineis vel lenticellis albis notato. *Folia* pergamacea, alterna, obovata, apice rotundata, basi cuneata, 5–9 cm. longa, 2·5–4 cm. lata, utrinque glabra, siccitate olivaceo-brunnea, costis 11–13, quarum circa 5–6 ad apicem productis, reliquis circa 1 cm. brevioribus, nervis multis brevibus vel interdum longioribus costis parallelis; petiolus circa 1 cm. longus, in laminam gradatim expansus. *Flores* ♀ in fasciculos 1–3-floros e ramulis anni praeteriti ortos dispositi, perulis minimis luteis suffulti; pedicelli 2 mm. longi; bracteae 5, patentes, luteae, sub tubo perianthii sitae. *Perianthii* tubus in ♀ ovato-oblongus, 5 mm. longus, siccitate niger;

lobi 5, triangulares, 1 mm. longi. *Discus* pentagonus, complanatus. *Stamina* 5, filamentis brevibus, antherarum thecis globosis. *Stigma* centrale, 5-lobatum. *Drupa* (immatura) ovato-oblonga, 5–6 mm. longa, endocarpio intus sulcato.—*H. granulata*, Hook. f. & Th.? Coll. et Hems. in Journ. Linn. Soc. xxviii. 121.

INDO-CHINA. Upper Burma: At Moungtaya, 1500 m., *Sir H. Collett*, 772. On an "ingyin" (*Pentacme suavis*, A. DC.?) tree at Mönghai, Kengtawng, *W. A. Robertson*, 326, April 1901.

710. **Henslowia shanensis**, *Gamble* [Santalaceae-Osyrideae]; species gracilis *H. buxifoliae*, Blume, affinis, foliis majoribus, floribus fasciculatis differt.

Frutex parasiticus, ramulis gracilibus teretibus ultimis angulatis cortice rufescente vix lenticellato. *Folia* coriacea, alterna, obovata, apice rotundata, basi cuneata, 3–5 cm. longa, 1–2 cm. lata, utrinque glabra, siccitate fere nigra, costis basi ortis 3, intermedia paulo superius nervos 2 emittente et cum iis fere ad apicem producta venis e costa centrali paucis brevibus curvatis; petiolus 0·5 mm. longus, in laminam gradatim expansus. *Flores* ♂ in fasciculos axillares vel e ramulis infra folia ortos basi perulis minimis suffultos dispositi, fasciculo utroque flores 2–7 gerente; pedicellus 1–2 mm. longus, bracteis 2–3 basin versus et bracteolis 3 sub perianthii tubo instructus. *Perianthii* tubus in ♂ obconicus, 1 mm. longus, glaber; lobi 5–6, triangulares, vix 0·5 mm. longi. *Discus* conspicuus, 5–6-lobatus. *Stamina* 5–6, filamentis brevibus, antherarum thecis globosis. *Stigma* centrale, complanatum, 5-lobatum. *Fructus* ignotus.

INDO-CHINA. Upper Burma: at Mönghai, Kengtawng, 450 m., *W. A. Robertson*, 295, March 1911.

V.—MISCELLANEOUS NOTES.

DR. C. A. BARBER.—We are informed that Dr. Barber, whose appointment as Government Botanist, Madras, was announced in *K.B.*, 1898, p. 277, has been appointed Government Sugar-Cane Expert at the Agricultural College, Coimbatore, S. India.

MR. JAMES GILBERT WATSON, formerly a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, an Assistant Superintendent of Government Plantations in the Federated Malay States.

MR. G. E. WILLIAMS, an employee in the Royal Botanic Gardens, Kew, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, to the post of a Working Forester in the East Africa Protectorate.

Additions and alterations to Gardens, 1912.—Additions to the collections of plants cultivated at the Royal Botanic Gardens, Kew, have been made during the year by exchanges with other gardens, private as well as public, and by purchase from nurserymen and others. Contributions of plants and seeds received from Botanic Gardens and other Institutions include the following :—

Agri-Horticultural Society of India. Wardian case of Hibiscus and Cannas.
Antigua. Plants of *Melocactus communis*.
Arnold Arboretum. American and Chinese trees and shrubs.
British Guiana. Palm and other seeds.
Calcutta. Two Wardian cases of Bamboos ; tubers of *Amorphophallus* ; collection of Himalayan seeds.
Dominica. Wardian case of Begonias ; succulent plants.
Dunedin. Wardian case of plants ; collections of native seeds.
Kumaon. Orchids.
Mauritius. Palm seeds.
Missouri. Agaves ; and seeds.
Ootacamund. Orchids.
St. Vincent. Bulbs of *Hippeastrum equestre*.
Southern Nigeria. Wardian case of plants ; seeds of *Raphia vinifera*.
Sydney. Collection of seeds.
Transvaal. Plants of *Musa ventricosa*, Euphorbias, etc.
Trinidad. Orchids.
U.S. Department of Agriculture. Various plants.
U.S. National Museum. Collection of Californian seeds.
Zanzibar. Two Wardian cases of plants ; collection of *Sansevieria* spp.

Exchanges were made with the Botanic Gardens of Edinburgh, Glasnevin, Cambridge and Oxford, and with most of the European gardens upon whom Kew is largely dependent for seeds of those annual herbaceous plants which fail to produce seeds at Kew.

Other donations to the Gardens include the following :—

Mr. H. Darton, Hertford. Collection of British mosses.
Mr. M. T. Dawe, Mozambique. Bulbs and seeds.
Capt. A. A. Dorrien Smith, D.S.O., Berkhamsted. Seedlings of Australian plants.
Dr. Drake Brockman, Berbera. Seeds of *Cordeauxia edulis* ("Yeheb").
Messrs. H. J. Elwes and W. R. Price. Plants and seeds collected in Formosa.
Messrs. Drège and Pillans, and Drs. Marloth and Schönland. South African Euphorbias.
Mr. J. Gossweiler, Angola. Collections of seeds.
Lady Grey. Cuttings of a collection of Cape Heaths.
Mr. A. W. Hill. West Indian Orchids.
Mr. G. N. Humphreys. Mexican seeds.
Mr. G. Hartmann, Niederhöchstadt, Mr. C. H. Lankester, Costa Rica, Mr. C. Roebelin, Bangkok, and Mr. F. S. Sillitoe, Khartoum. Orchids.
Prof. Pearson, Cape Town. Numerous succulent plants, bulbs and seeds.

Dr. G. V. Perez, Teneriffe. Seeds of Canary Island plants.
Dr. R. S. Rogers, Adelaide. Australian ground Orchids.
Dr. P. Roth, Bernberg. Ceropegias.
Hon. N. C. Rothschild. Large plant of the rare *Echinocactus arizonicus*.
Messrs. Sander and Sons, St. Albans and Bruges. Orchids, etc.
Mr. Philippe L. de Vilmorin, Paris. Herbaceous plants.

A number of interesting plants exhibited at the Royal International Horticultural Exhibition were purchased.

Among the plants and seeds of interest distributed from Kew during the year were the following:—Agave seeds (in variety), Chinese plants of recent introduction, *Cordeauxia edulis*, "Yeheb" (seeds), *Musa ventricosa* (seeds), *Rhamnus Purshiana*, and *Zizania aquatica*.

Wardian cases of plants were sent to Northern Nigeria and Trinidad. Surplus trees, shrubs and herbaceous plants were presented to public institutions, and surplus Nymphaea tubers to public gardens. Collections of plants were sent to Antigua Botanic Station; Arnold Arboretum; Berlin Botanic Garden; Brussels Botanic Garden; The Residency, Berbera; Canadian Department of Agriculture; Liverpool Botanic Garden; National Fruit and Cider Institute; Osborne, I.W.; Oxford University Parks; Richmond Park; University College, Reading; University College School and U.S.A. Department of Agriculture, etc.

There was a large demand for seeds ripened at Kew and offered for distribution in *Bulletin*, Appendix 1, 1912.

Certain alterations and improvements have been carried out in the Botanic Gardens proper during the past year, among which the following are the more important:—

The reglazing of the central portion of the Temperate House has been completed, and the roof of the South Octagon reconstructed. A new house for Cattleyas, Cymbidiums, Sobralias, etc., has been erected on the south side of the T Range. The Rock Garden, which was made in 1882, having become somewhat overgrown and out of date, it was decided two years ago to reconstruct parts of it and remove several large trees the shade from which is unfavourable to alpine plants. The stone used is weathered mountain limestone from the Cheddar district. It is intended to complete the work in the autumn.

The following specially noteworthy plants flowered during the year:—

Agave, 6 species, including the fine specimen of A. atrovirens.
Akania Hillii.
Amherstia nobilis and Bakiaea insignis flowered freely in No. 1.
Amomum hemisphericum.
Anemopaegma grandiflorum.
Callicarpa purpurea, fruited well.
Catasetum, 20 species.
Coelogyne, 28 species.
Columnea gloriosa.

Coryanthes macrantha.
Cycadeae, 15 species.
Dahlia imperialis.
Eulophiella Elizabethae.
Pachira insignis.
Pinguicula gypsicola.
Pycnostachys Dawei.
Rosa gigantea.
Typhonodorum Lindleyanum, a young plant two years old from seed ripened at Kew, bore four fine flowers.
Solandra Hartwegii.

Pergola for Vines.—The need for a better means of exhibiting the collection of Vines (Vitis and allied genera) at Kew has long been felt. Ever since the reorganisation of the Arboretum by Sir Joseph Hooker about 40 years ago they have been grown on a curving line of iron posts near the North Gallery, where they have had to be treated as bushes rather than climbers; being pruned back every winter and the shoots being shortened once or twice during the summer. A pergola of the same type as the Rose Pergola has now been provided for them. It consists of two rows of iron uprights connected by flattish arching rods and linked together lengthwise by chains. The pergola is about 500 feet long, 11 feet wide, 10 feet high, and about 12 feet between each pair of uprights. It runs parallel with the Acacia Avenue, between it and the Refreshment Pavilion.

Riverside Avenue.—The northern end of the belt of trees and shrubs between this Avenue and the Ha-Ha near the Thames, whose object is to hide from view the ugly workshops and warehouses on the Brentford side of the river, has for some time been in an unsatisfactory state. In the belt were 30 to 40 middle-sized elms whose hungry roots effectually barred the growth of any but the coarsest shrubs beneath them. The undergrowth had in late years, in fact, become merely a thicket of ill-grown shrubs which served well enough as a screen in summer, but revealed its unsatisfactory and uninteresting character only too clearly in winter. A commencement has been made this winter to provide a belt of a different character. The elms, which had nearly all originated as suckers from a few older ones, have been cleared away and nearly one-half the belt has been replanted with an almost purely evergreen vegetation composed of Holm oak, pines, cherry laurels, bay laurel, and others of smaller growth. They have been brought here from various parts of the garden, the larger ones being 20 to 25 feet high.

Incidentally the Riverside Avenue itself will be much improved. Owing to the widely spreading, hungry roots of the elms and to the drip and shade from their branches, together with the increasing crowds that visit Kew, it has been impossible to keep the turf of the avenue in good order in recent years. The removal of the elms will relieve the grass from much competition at the root and the widening of the avenue will help to distribute the traffic over it more thinly and to let in more light and air.

This avenue, which now reaches from the Brentford Gate to the Isleworth Ferry Gate, once extended apparently to the mound in the S.W. corner of the Queen's Cottage Grounds where, in the 18th century, stood one of the temples or summer-houses erected by Queen Caroline. Owing probably to its nearness to the Thames it has for over one hundred years been a popular promenade. Evans, writing in 1825, in lament of the departure of Royalty from Kew ("Richmond and its Vicinity") says: "A respectable friend of Brentford informed me that when their Majesties resided at Kew the terrace near the river was frequented, especially on Sunday evenings, with a concourse of nobility and gentry. Stars and ribbons and garters glistened on the eye in uninterrupted succession. No music exhilarated the company, but the translucent stream of old Father Thames glided by with an equable and enviable placidity. All that gay and bustling scene, like a meteor shooting across the heavens, has vanished."

Sion Vista.—In his report for 1882, Sir Joseph Hooker observed that during the year the Sion Vista, previously occupied by a broad walk of rough gravel, which being unrolled was never walked upon, had been covered with soil and sown with grass seed. Since then, owing to most of the gravel being left in the walk, the grass has never grown satisfactorily, and as soon as a few hot dry days of summer weather came, the site of the old walk was always clearly defined by the grass turning brown. The consequence was that, in dry summers especially, the aspect of this fine vista was spoilt. The only remedy was to remove the gravel and provide the grass with a depth of soil similar to that at the sides. This work has been in progress as opportunity offered for the last seven or eight years. Much of the old walk was found to have been filled to a depth of 18 inches with a coarse shingle and sand. This was put through a screen, the sand being returned and soil being substituted for the shingle. The work was completed in December.

Rose Dell.—It has been found necessary to renew the soil in parts of the Rose Dell near the Pagoda made sixteen years ago, which had become overrun with the roots of adjoining trees. The occasion has been taken to add a selection of the best and most distinct of the new rambler roses to the collection planted here.

Additions to Arboretum.—As has been the case now for some years past, the most noteworthy additions to the hardy ligneous collections during 1912 have been of Chinese origin. These have been presented by the Arnold Arboretum, Mr. J. C. Williams of Caerhays, Messrs. Veitch, Mr. Maurice L. de Vilmorin and the Hon. Vicary Gibbs. Most of the plants are still under number, and to those of Mr. Wilson's collecting are now being added the results of the journeys of Messrs. Purdom and Forrest. Mr. Forrest is still in, or on the borders of, China. A very charming dwarf rhododendron of his introduction, *R. fastigiatum*, Franchet, flowered during the year; a species resembling *R. intricatum* in leaf and in colour of flower but very distinct in the long exserted stamens. It is interesting to note that both at Kew and with Mr. J. C. Williams it flowered when only a few inches high and within 17 months of sowing the seed—a remarkably short

period compared with that taken by most seedling rhododendrons. From Canon Ellacombe have been received several plants of great interest, especially old-fashioned roses of which he has so fine a collection. The Earl of Ducie sent seeds of *Fagus obliqua* which germinated well, and various plants have been received from Miss Ellen Willmott, Sir John Ross of Bladensburg, and Lady Hanbury, La Mortola.

Besides Messrs. Veitch among nurserymen, the establishment is indebted for valued contributions to Mr. Notcutt of Woodbridge, Messrs. Cheal, and Messrs. Slocock of Woking.

The following plants flowered for the first time in the Arboretum department :—

Berberis candidula	... ...	China.
„ Stapfiana	(also fruited) ...	„
„ verruculosa	(„ „) ...	„
Corylus lacera	(„ „) ...	Himalaya,
„ mandschurica	(„ „) ...	Manchuria.
Deutzia longifolia ...	... ...	China.
Dipteronia sinensis	... ...	„
Fagus antarctica var. uliginosa	... ...	S. America.
„ obliqua	... ...	„
Hamamelis vernalis	... ...	N. E. America.
Magnolia salicifolia	... ...	Japan.
Pinus Armandii (also bore cones)		... China.
Rhododendron Davidii	... .	„
„ fastigiata	... ...	„
Ribes laurifolium ...	... ...	„
Rosa sertata	... ...	„
Rubus biflorus var. quinqueflorus		... „
„ Giraldianus (also fruited)		... „
Salix Bockii ..	... ...	„
Sinofranchetia sinensis	... ...	„
Spiraea (Sorbaria) arborea	... ...	„
Stachyurus chinensis	... ...	„

Among plants of interest which have flowered once or twice before, Aesculus californica, Elliottia racemosa and Styrax Wilsonii were particularly good during the past year.

Waterfowl.—The past year has been a very successful one as far as the collection of waterfowl is concerned. The number of birds reared in the gardens was as follows :—Carolina ducks 34, Sheldrake 6, Cinnamon Teal 5, Common Teal 2, as well as a large number of Tufted duck, Moorhens and a few Dabchicks. Four Magellanic geese were reared, but only a small number of the other species of geese kept in the gardens owing to the destruction of eggs by carrion crows. These birds also killed the cygnet belonging to the black-necked swans when it was about ten days old.

Of other birds one stork was reared and four peafowl. The attempt of the Demoiselle cranes to hatch out a bird from the solitary egg laid proved abortive.

The only birds which produced a family and failed to rear their offspring were the Bahama ducks, which did not make a nest until too late in the year.

Three hybrids apparently between a Maned gander and a hybrid yellow-bill duck have been reared and are growing into handsome birds.

The following birds have been received in exchange for surplus Carolinas and other birds reared at Kew :—

A pair of Chestnut-breasted Teal, 1 Brazilian Teal, 1 Grey Teal and a pair of Blue-winged Teal from the Zoological Society of London. A Japanese or Baikal Teal and a Ruddy Sheldrake from H.M. Office of Works. One pair Cinnamon Teal, 1 pair Chiloe Widgeon, 1 pair Chile Pintail, 1 pair Chilian Teal, 1 Rosy-bill Duck and 3 Japanese Teal from various sources.

Through the kindness of Dr. Peringuey, Director of the South African Museum, Cape Town, an attempt was made to introduce the Black-footed Penguins from the Cape. A pair of these interesting birds reached Kew and settled down happily on the pond, but in the course of their wanderings one night they got outside the gardens. One of them was recaptured in the Ha Ha ditch, but the other, which had discovered the river, was hunted down by men from Brentford in boats and killed. The solitary bird again escaped when replaced in an enclosure on the pond and was at large for some days on the river above Richmond. According to a well-known daily paper the penguin was "a Japanese fishing Cormorant" which, "as it seldom rose from the water and disappeared for long intervals, many people mistook it for an otter." On its capture by the river police, the penguin was handed over to the charge of the Zoological Society.

Official Visits.—During the past year the vote for travelling expenses has been utilised as follows :—

The Director.—For the purpose of studying at the Herbarium of the Museum d'Histoire Naturelle, Paris.

The Assistant Director.—For travelling in Trinidad and Dominica.

The Curator.—In visiting horticultural establishments near Manchester.

The Assistant Curator.—To visit gardens in the Riviera, Italy, Istria and Dalmatia.

Mr. Irving.—To study the high Alpine vegetation of Switzerland.

The Keeper of the Herbarium.—For the purpose of continuing the study of the distribution of *Spartina* in Southampton Water and the Isle of Wight.

Mr. Skan.—In a visit to Paris for the purpose of studying at the Herbarium of the Museum d'Histoire Naturelle.

The Keeper of the Museums.—To visit Liverpool in connection with the importation of Tropical products.

Mr. Holland, Assistant in Museums.—For the purpose of attending the annual meeting of the Museums Association held at Dublin.

Mr. Dallimore, Assistant in Museums.—For the purpose of attending the meeting of the Royal Scottish Arboricultural Society, and in visits to Leicester in connection with the Willow industry.

Museums.—During the past year many interesting contributions have been made to the Museums, the more important having been recorded from time to time in the *Bulletin*.

A considerable number of fully labelled duplicate specimens have been distributed to various Institutions, including the following :—Cynfarthfa Castle Museum and Art Gallery, Merthyr Tydfil ; Public Library and Technical Schools, Worksop ; Borough Polytechnic Institute, London ; Museum, Florence ; University, Aberdeen ; Municipal Technical Institute, Belfast ; School for the Blind, St. Leonards, &c.

For the Bath and West and Southern Counties Show held at Cardiff, an exhibit was prepared for the Forestry Section, consisting mainly of duplicate material.

Though much has been accomplished in the period in generally improving the permanent collections, this section of the work has been somewhat hampered by the steadily increasing number of products received for determination, together with applications for general information on the properties, uses, and literature bearing upon various vegetable products.

In Museum No. IV., additional case accommodation has been provided in one of the upper rooms, and it is to be hoped that the remaining room will likewise be furnished during the present year. A third of the cases have been re-polished in Museum No. I., and much has been done in generally improving and re-labelling the contents of the cases on the top floor of this Museum.

Presentations to Museums.—The following miscellaneous specimens have been received in addition to those previously recorded in the Bulletin :—

Mr. Farquhar.—Section of wood of *Farquharia elliptica* from Southern Nigeria.

Mr. Charles Coltman Rogers, Stanage Park, Brampton Brian.—Cones of *Abies pectinata* and of *Abies numidica*.

Mr. A. Bruce Jackson.—Cones of *Abies magnifica*.

Mr. W. R. Price.—Chips of camphor wood (*Cinnamomum Camphora*) from Kagoshima, Japan.

The Right Honourable the Earl of Moray, Darnaway Castle, Forres.—Photographs of scenery in Darnaway Forest.

Messrs. Suarez Hermanos & Co., Ltd., Fenchurch Street, London, E.C.—Samples of Bolivian Rubber.

His Grace the Duke of Northumberland, Syon House, Brentford.—Section of trunk of Black Walnut (*Juglans nigra*) and Cones of *Taxodium distichum*.

Mr. C. K. Bancroft, Kuala Lumpur, Federated Malay States.—Sections of wood of Para Rubber tree (*Hevea brasiliensis*) to illustrate the production of burrs or nodules.

Mr. John Christie, Mark Lane, London, E.C.—Photo micrographs of stem and fibre of *Hedychium coronarium*. (See *K. B.*, No. 9, 1912.)

Mr. J. S. Gamble, Highfield, Liss, Hants.—Specimens of *Loranthus pentandrus* on a species of Citrus, also stems of *Indigofera pulchella* with galls. From the Shan States.

Mr. G. D. Patterson, Kew.—Fossil specimen of *Lepidostrobus*.

Dr. A. Galt, The Royal Scottish Museum, Edinburgh.—Examples of root-swellings on Alder (*Alnus glutinosa*).

The Right Honourable Lord Wimborne, Canford Manor, Dorset.—Section of trunk of *Cedrus atlantica*, also a plank of Black Poplar (*Populus nigra*).

Mr. Sydney Moore, Harden, Bingley.—Specimen of Bark Cloth made from a species of *Ficus*, Uganda.

Director of Agriculture, Southern Nigeria.—Spadices and Fruits of the Oil Palm (*Elaeis guineensis*).

Director, Botanic Gardens, Sydney, New South Wales.—Specimen of Western Whitewood (*Atalaya hemiglauca*).

Director of Agriculture, Mozambique.—Photograph and specimen of wood of *Khaya nyasica*.

Research in Jodrell Laboratory in 1912 :—

Avebury, Lord.—Notes on Pollen. (Journ. Roy. Microscop. Soc., 1912, pp. 473–512, tt. 7 and 8.)

Clark, J. J., Miss.—Abnormal Flowers of *Amelanchier spicata*. (Ann. Bot., vol. xxvi., pp. 948–949, with twelve figs. in text.)

Davie, R. C.—The Structure and Affinities of *Perunema* and *Diacalpe*. (Ann. Bot., vol. xxvi., pp. 245–268, tt. 28 and 29.)

Massee, G.—Additions to the wild Fauna and Flora of the Royal Botanic Gardens, Kew.—xiii. [*Chaetomium*, etc.]. (Kew Bull., 1912, pp. 161–166, with one plate.)

Massee, G.—A Disease of Sweet Peas, Asters and other Plants (*Thielavia basicola*, Zopf.). (Kew Bull., 1912, pp. 44–52, with one plate.)

Massee, G.—"White-heads" or "Take-all" of Wheat and Oats (*Ophiobolus graminis*, Sacc.). (Kew Bull., 1912, pp. 435–439, with five figs. in text.)

[**Massee, G.**]—Tomato-Leaf Rust. (Journ. Board Agric., vol xviii., pp. 920–921, with one plate.)

[**Massee, G.**]—Diseases of Raspberry and Loganberry. (Journ. Board Agric., vol. xix., pp. 124–126, with one plate.)

Massee, G.—The Presence of Tubers on Potato Haulms. (Journ. Board Agric., vol. xix., pp. 560–563, with one plate.)

Rothert, W.—Ueber Chromoplasten in vegetativen Organen. (Extr. du Bull. de l'Acad. des Sciences de Cracovie, sér. B.: Sci. Nat., 1912, pp. 189–335.)

Scott, D. H.—On *Botrychioxylon paradoxum*, sp. nov., a Palaeozoic Fern with Secondary Wood. (Trans. Linn. Soc., 2 ser., vol. vii., pp. 373–389, tt. 37–41.)

Yapp, R. H.—*Spiraea Ulmaria*, L., and its Bearing on the Problem of Xeromorphy in Marsh Plants. (Ann. Bot., vol. xxvi., pp. 815–870, tt. 81–83, with eleven figs. in text.)

Mr. L. A. Boodle continued an examination of the structure of the seeds of an Aroid, and studied the anatomy of some Dicotyledonous plants in relation to their affinities, and of some fasciated and other anomalous specimens.

Miss J. J. Clark examined the structure of some abnormal flowers of *Amelanchier* showing staminoid petals : see above.

Dr. J. V. Eyre investigated several species of *Linum* in relation to the presence of certain glucosides and enzymes.

Dr. J. A. Samuels carried on a developmental and cytological investigation of the ovule and embryo-sac in some species of *Araceae*.

Mr. A. Sharpies began a research on a fungal disease of species of *Rhododendron*.

Prof. R. W. Smith examined the ovule and gametophytes of *Cedrus*, and the ovules of some other conifers.

Mr. J. M. Thompson studied the flowers of a number of Dicotyledons with regard to floral zygomorphy.

Pathology.—The quantity of material submitted to Kew for examination during the past year has been much in excess of previous years. No parasite, not previously recorded, has been noted as causing injury to any serious extent. The disease of raspberry and loganberry canes, caused by *Hendersonia rubi*, appears to be extending its area, many examples from widely separated localities having been received during the year.

The frequent occurrence of tubers on the above-ground parts of potato haulms has been very marked. This subject has been dealt with in the Journal of the Board of Agriculture.

Ophiobolus graminis, a fungus causing "blindness" in the ears of wheat and oats, is apparently on the increase, and has been investigated.

The presence of mould on pork received from China has been examined.

Pathological material has been received from the Federated Malay States, New Zealand, Nigeria, Uganda, West Indies, &c.

Additions to the Herbarium during 1912.—During the year about 32,000 specimens were received as donations or exchanges, while about 5,000 were purchased. The principal collections are enumerated below.

EUROPE. *Presented* :—Cryptogamae Exsiccatae, Cent. xx., by Dr. A. Zahlbruckner ; Fungi, by Dr. G. Bresadola.

Purchased :—H. Sudre, Herbarium Hieraciorum, fasc. 1 ; Fiori and Béguinot, Flora Italica Exsiccata, fasc. 15–16 ; A. Kneucker, Cyperaceae et Juncaceae Exsiccatae, Liefr. 8–9 (including extra-European specimens) ; F. Körnicke, Cereals ; H. Dahlstedt, Taraxaca Scandinavica Exsiccata, fasc. 2 ; P. Sydow, Mycotheca Germanica, fasc. 22–23 ; J. Serebrianikow, Mycotheca Rossica, fasc. 6–7.

ORIENT. *Purchased* :—J. Bornmüller, Syria.

NORTHERN ASIA. *Purchased* :—Miss A. M. Creswell, Kashgar.

CHINA. *Presented* :—Père G. Giraldi and Père C. Silvestri, by Dr. R. Pampanini ; Dr. J. M. Dalziel, by the Regius Keeper, Royal Botanic Garden, Edinburgh.

Purchased :—Prof. C. S. Sargent, E. H. Wilson's Chinese plants.

INDIA AND MALAYA. *Presented* :—Kashmir, by Mr. G. L. de la C. Fuller ; Punjab, etc., by Mr. J. R. Drummond ; Kachin, by Capt. S. M. Toppin ; Burma, by Mr. J. H. Lace and Mr. W. A. Robertson ; Siam, by Dr. A. F. G. Kerr, Mr. W. F. Lloyd, Mr. H. B. G. Garrett and Luang Vanpruk ; Malay Peninsula, by the Superintendent, Royal Botanic Gardens, Calcutta, Mr. J. S. Gamble and Mr. J. W. Anderson ; British North Borneo, by Miss L. S. Gibbs ; Celebes, by Dr. R. Schlechter ; New Guinea, by the Director, Rijks Herbarium, Leiden ; Philippine Islands, by Mr. E. D. Merrill ; Malay Archipelago, by the Director of the Botanic Garden, Buitenzorg ; Malay Fungi, by Dr. G. Bresadola.

Purchased :—A. D. E. Elmer and C. M. Weber, Philippine Islands.

AUSTRALASIA. *Presented* :—Australia, by the Director, Botanic Gardens, Sydney ; Queensland, by the Colonial Botanist, Brisbane ; New Zealand, by Mr. T. F. Cheeseman and Miss L. S. Gibbs ; Fiji, by Miss L. S. Gibbs.

TROPICAL AFRICA. *Presented* :—Sierre Leone, by Mr. C. E. Lane-Poole ; Gold Coast, by Mr. T. F. Chipp ; Northern Nigeria, by Mr. C. C. Yates ; Southern Nigeria, by Mr. and Mrs. P. A. Talbot, Mr. N. W. Thomas, and the British Museum (Natural History) ; Somaliland, by Dr. R. E. Drake-Brockman ; Uganda, by Miss M. H. Mason ; Katanga, by Mr. H. A. Homblé, through Mr. J. Burtt-Davy ; British East Africa, by Mr. E. Battiscombe ; Portuguese Nyasaland, by Mr. C. E. F. Allen ; Percy Sladen Memorial Expedition collections, by the Percy Sladen Memorial Trustees, through Prof. H. H. W. Pearson and the Curator of the Bolus Herbarium.

Purchased :—G. Zenker, Cameroons, through Prof. E. Gilg ; Rev. F. A. Rogers, Rhodesia.

MASCARENE ISLANDS. *Presented* :—Madagascar grasses, by the Hon. P. A. Methuen, through Prof. H. H. W. Pearson, and by Mr. E. Perrier de la Bâthie, through Prof. H. Jumelle.

South Africa. *Presented*:—Various collections by the late Dr. H. Bolus, through Mrs. F. Bolus, and by Dr. R. Schlechter, through Dr. Hans Schinz; Giftberg, by Mr. E. P. Phillips, through Prof. H. H. W. Pearson; Transvaal, by Mr. J. Burtt Davy; Pondoland, by Miss M. H. Mason; Natal, by Mr. J. Medley Wood.

Purchased:—W. Barron, specimens of Erica.

North America. *Presented*:—Various specimens, by Prof. C. S. Sargent; by Mr. J. B. Leiberg, through the Smithsonian Institution; grasses, by the United States Department of Agriculture; California, by Prof. W. A. Setchell.

Purchased:—F. S. Collins, Phycotheca Boreali-Americana, fasc. 36–37; Prof. J. Macoun, Canadian Mosses, Hepaticae and Lichens.

West Indies. *Presented*:—Cuba, Jamaica, etc., by Dr. N. L. Britton; Tobago, Trinidad, etc., by Mr. W. E. Broadway.

South America. *Presented*:—Brazilian Malpighiaceae, by L. Riedel, through the Director, Imperial Botanic Garden, St. Petersburg; Herbarium of the late E. F. André, by the Bentham Trustees; Falkland Islands, by Mrs. E. Vallentin.

Purchased:—Dr. Otto Buchtien, Herbarium Bolivianum, Cent. i.

The largest contribution during the year was the herbarium of the late Edouard François André, which contains 14,000 sheets and was presented by the Bentham Trustees. Most of the specimens were collected by André in Colombia. Dr. A. F. G. Kerr has sent additional specimens from Doi Sootep, Siam, as well as those collected on a tour eastwards to Nan, whence he proceeded northwest to Chiengrai, returning southwards to his headquarters at Chiengmai. He has also sent a collection from Sriracha on the south coast of Siam. Large collections from Old Calabar have been received from Mr. and Mrs. P. A. Talbot, and from Asaba and vicinity (Southern Nigeria) from Mr. N. W. Thomas, Government Anthropologist. Mr. T. F. Chipp has sent an interesting collection from the Gold Coast. The Percy Sladen Memorial Trustees have presented collections made during the expeditions in South-West Africa under their patronage by Prof. H. H. W. Pearson and others. Dr. N. L. Britton has communicated collections made by him during his recent visit to Cuba, as well as specimens from other West Indian islands. Mrs. Elinor Vallentin has presented the large collection (including many cryptogams), which she made during her residence in the Falkland Islands, 1909–1911. Mr. Alwyn Berger has sent at various times fresh specimens of plants flowering at La Mortola. More than 7000 specimens have been received on loan for working up the African floras and for research on special groups.

Presentations to the Library during 1912.—The collection of Herbals at Kew, now a considerable one, has been augmented during the year by numerous purchases made on behalf of the establishment by the Bentham Trustees, who have presented most of the works of this class added to the library in the course of the last twenty years. Among the more interesting and valuable of those received from them in 1912 is an excellent copy of the *New Kreuterbuch* (Basel, 1543), by Leonhard Fuchs. This is a German edition of *De historia stirpium commentarii insignes* (1542),

a work rivalling the best of the Valgrisian editions of Mattioli's *Commentarii* in the fine woodcuts of plants for which it is remarkable. These woodcuts are the same in the two editions.

Six editions of Mattioli's works have been presented by the Bentham Trustees. These include the rare first Italian edition, published in Venice in 1544, which is the earliest work attributed to Mattioli. This lacks the figures of plants which are present in varying numbers and sizes in all the other editions at Kew, and it further differs in being furnished with small woodcut initials to the chapters, there being in some instances as many as six or eight on one page. The 1581 Italian edition has also been acquired, as well as the Latin editions (Valgrisian) of 1560 and 1570. It is recorded that it was to the 1560 Latin edition that Gerard and Parkinson were especially indebted.

The first Bohemian edition of Mattioli's Herbal (by Mattioli and Hagecius ab Hagek), published in Prague in 1562, is a rare work and has been described as "the finest Herbal in existence." It contains the large woodcuts characteristic of the best Valgrisian editions and is the earliest of Mattioli's works at Kew in which these large woodcuts are present. They differ markedly from those of Leonhard Fuchs' work referred to above in being heavily shaded. A good copy, in contemporary stamped pigskin, is among the presentations by the Bentham Trustees. The establishment is also indebted to them for a well-preserved copy of the 1517 Latin edition of the *Ortus Sanitatis*; Brunfels, *Contrafayt Kreuterbuch*, Strasburg, 1532; Dodoens, *A New Herball*, London, 1595; Lobel, *Plantarum seu Stirpium icones*, Antwerp, 1581 (first edition); Petrus de Crescentiis, *Opera di Agricoltura*, Venice, 1534; Pliny, *Historia naturalis libri xxxvii*, Venice, 1513, antedating any other edition at Kew by nearly a century. Porto, *Phytognomonica*, Naples, 1588 (first edition); also a copy, not quite complete, of the *Histoire de la Navigation de Jean Hugues de Linscot* (Linschoten), Amsterdam, 1610; two copies of the sixth volume of Elwes and Henry's *Trees of Great Britain, and Ireland*; *Nova Acta Academiae C.L.C. Germanicae Naturae Curiosorum*, vols. 90 to 95, in continuation; and the issues for the year of about thirty periodical or serial publications, received in exchange for *Hooker's Icones Plantarum*.

The library now possesses the interesting series of original sketches made by Sir J. D. Hooker during his Indian travels, some of which have been reproduced in his *Himalayan Journals*. They have been laid down in a large folio volume, which, according to a wish expressed in Sir Joseph's will, has been sent to Kew by his executors, from whom has also been received another large folio volume containing the great botanist's numerous diplomas.

From the Royal University of Upsala a number of books and pamphlets on Swedish botany has been received, including: N. C. Kindberg's *Svensk Flora*, 1877; *Schwedische Reise in den Jahren 1765-1766*, by J. Beckmann, edited by Th. M. Fries, 1911; and *Schedulae ad S. J. Enandri Salices Scandinaviae exsiccatas*, fasc. 1–3, 1910–11.

Sir Frank Crisp, Bart., has presented the *Illustrations of Conifers* by H. Clinton Baker, 1909, a valuable work of which two

volumes have so far appeared; also Tīmīriazeff's *The Life of the Plant*, translated by A. Chéréméteff, 1912, and the English edition of *The Alpine Flora*, by H. Correvon and P. Robert [1912]. The original edition of the last named was presented by Sir Frank in 1909.

From the Secretary of State for India another volume of Mr. W. Foster's work *The English Factories in India*, dealing with the period between 1637 and 1641, and a further portion of *The Bower Manuscript* have been received.

The *Actes du IIIme Congrès International de Botanique* (Brussels, 1910) were published last year in two volumes under the direction of Dr. E. De Wildeman, by whom they have been sent to the library.

Dr. S. H. Koorders has contributed a set of his *Exkursionsflora von Java*, published by G. Fischer of Jena, 1911–12. Though the descriptive matter is arranged mainly in the form of keys, the work forms three large octavo volumes, comprising altogether nearly 1700 pages, with 17 plates, 4 maps, and 139 text-figures. It impresses us as being most carefully done, and we welcome it as a valuable guide to a rich and interesting flora.

Prof. Hans Schinz has continued to send the *Mitteilungen aus dem botanischen Museum der Universität Zürich*. Among those received in 1912 are: *Die Algenflora der Limmat vom Zürichsee bis unterhalb des Wasserwerkes*, by H. Limanowska, 1911; *Deutsch-Südwest-Afrika, in botanischer Beziehung*, 1, by H. Schinz, 1911; and further *Beiträge zur Kenntnis der afrikanischer Flora und der Schweizerflora*, edited by H. Schinz.

Mr. W. Botting Hemsley has presented a set (250) of the plates prepared for Mr. T. F. Cheeseman's forthcoming work, *Illustrations of the Flora of New Zealand*. The plates have been drawn under the direction of Mr. Hemsley by Miss M. Smith and lithographed by Mr. J. N. Fitch.

The second edition of Mr. Arthur Lister's fine *Monograph of the Mycetozoa*, revised by Miss Gulielma Lister, 1911, has been received from the Trustees of the British Museum.

Mr. J. H. Maiden's *Critical Revision of the genus Eucalyptus* has now reached part 16. Parts 14 to 16 have reached the library during the year from the author, and the continuation of his *Forest Flora of New South Wales* (four parts) has been received from the Honourable the Secretary for Agriculture, Sydney.

Mr. Zygmunt Wóycicki of Warsaw has begun a work illustrating the vegetation of Poland, following the plan of the well-known *Vegetationsbilder* of Karsten and Schenck. It is entitled: *Obrazy Róslinnosci Królestwa Polskiego*. Three parts, each containing ten plates, with descriptive text in Polish and German, have so far been issued, and for these the establishment is indebted to the author.

An interesting manuscript has been presented by Canon Ellacombe. It is a transcript of the account of Samuel Brewer's journey from Yorkshire to London in 1691. It bears the title *Adversariorum Hodoeporicum*, and on a fly-leaf it is stated that "the original is in the possession of Miss Currer at Eshton Hall." Brewer, who was the first to discover *Dianthus caesius* in Britain,

visited the Chelsea Physic Garden which he described as "a pretty collection but not such as many boast it to be."

John Smith, Curator of the Royal Botanic Gardens, Kew, from 1841 to 1864, evidently contemplated a much more comprehensive history of the establishment than that afforded by his *Records*, for the library has received from Dr. J. H. Wilson, of the University of St. Andrews, a thick volume, foolscap-folio size, containing manuscript and printed matter relating to the gardens, and lettered on the back: "History of the Royal Gardens Kew by John Smith."

Among the other presentations to the library may be mentioned *Hortus Mortolensis*, by A. Berger, received from Lady Hanbury; *Icones of the Bamboos of Japan*, and *Illustrations of Japanese Fungi*, from the Bureau of Forestry, Tokyo; *Plantae Wilsonianae*, edited by Prof. C. S. Sargent, part II, from the editor; *North American Flora*, published by the New York Botanical Garden, vol. vii. part 3, and vol. xvii. part 2, from Dr. N. L. Britton; *Icones Plantarum Koisikavenses*, vol. i. nos. 1–3, from the editor, Prof. J. Matsumura, who has also sent the final part (vol. ii. part 2) of his *Index Plantarum Japonicarum;* nos. 54–61 of the *Journal of the Straits Branch of the Royal Asiatic Society*, from the Secretary; *Les plus belles Roses au début du xxe siècle*, received from the Section des Roses de la Société Nationale d'Horticulture de France through the President, Mr. M. L. de Vilmorin; a copy of Lindley's *Genera and Species of Orchidaceous Plants*, once the property of C. L. Blume, from Sir Everand im Thurn, K.C.M.G.; and a set of his numerous papers from Mr. H. N. Ridley.

The titles of works presented by their authors, among whom should be specially mentioned Mr. J. E. Anderson, Dr. L. Capitaine, Mr. J. Cardoso, Junr., Mr. R. W. T. Günther, Dr. B. Hayata, Mr. U. P. Hedrick, Dr. T. Nakai, Mr. W. A. Talbot and Dr. F. Tobler, will be included in the next supplement to the library catalogue which will form Appendix 2 to the *Kew Bulletin*, 1913.

Botanical Magazine for January.—The plants figured are *Senecio stenocephalus*, Maxim. (t. 8472); *Rosa sertata*, Rolfe (t. 8473); *Clerodendron Bakeri*, Gürke (t. 8474); *Amorphophallus corrugatus*, N. E. Brown (t. 8475); and *Aster Purdomii*, Hutchinson (t. 8476).

The *Senecio* is a handsome species belonging to the section *Ligularia*, and has very large cordate leaves and yellow flower-heads, arranged in a raceme, which is sometimes 14 inches long. It is distinguished from *S. Ligularia*, Hook. f. by the long and narrow bracts which subtend the peduncle, and by the narrower few-flowered heads. The species is a native of Japan and Northern China, and the specimen figured was communicated by Messrs. J. Veitch & Sons, who have raised plants from seeds collected in the latter region by Mr. W. Purdom.

Rosa sertata is a pretty new species which Messrs. Veitch have introduced from China and presented to the Kew collection. It is closely allied to *R. Webbiana*, Wall., differing in a laxer habit, more slender prickles, longer leaves and narrower fruits, and proves to be identical with two plants received as this species from

Messrs. Vilmorin, Andrieux & Co., and with another, raised from seed collected by Mr. A. Henry, which the late Prof. Crépin thought might be a small-leaved form of *R. macrophylla*, Lindl. It is larger in all its parts than *R. Willmottiae*, figured at t. 8186. The Kew plant of *R. sertata* flowered in June, 1910.

Clerodendron Bakeri is a handsome shrub attaining a height of about four feet, with large oblong or oblong-elliptic leaves, and showy heads of white fragrant flowers. It is a native of West Tropical Africa, occurring in the region of the Lower Congo and in Sierra Leone. The figure has been prepared from material obtained from a plant presented to Kew in 1910 by Captain Munro, R.N., of Woodlands, Binfield.

Amorphophallus corrugatus has recently been described for the first time from specimens collected by Dr. A. F. G. Kerr in the evergreen forest on the Doi Scotep mountain, in the district of Chiengmai, Siam. In addition to sending herbarium material to Kew, Dr. Kerr forwarded living tubers to the Botanic Garden of Trinity College, Dublin, where one flowered in April, 1912, and supplied the specimen figured. The species is easily distinguished from its nearer allies by the spathe being open in front almost to the base, by the curiously corrugated appendix, and by the purple ovaries.

Aster Purdomii is a new species which Messrs. Veitch have introduced, through their collector Mr. W. Purdom, from the province of Shensi, Northern China, and which flowered at Coombe Wood in May, 1912. In habit it resembles *A. alpinus*, Linn., but it may be distinguished from this and all the other Asiatic species by the distinctly stalked ovate or ovate-elliptic radical leaves, with two or three small teeth, associated with almost leafless stems and solitary flower heads. It promises to be a useful plant for the rock garden.

Echinocactus ornatus.—We are indebted to Mr. F. de Laet of Contich for drawing our attention to the fact that the plant figured as *E. ornatus* on the plate in *K.B.*, 1912, facing p. 300, is really *E. myriostigma*. In the true *E. ornatus* the spines with which the plant is armed are ¾ in. long, and such spines are entirely absent in *E. myriostigma*, the plant figured.

The plant had been obtained under the name *E. ornatus*, and the identification had not been verified at the time of the publication of the figure.

N. E. B.

Entandrophragma.—The timber of several species of *Entandrophragma* is shipped from West Africa under the trade name of Cedar. In view of the commercial importance of the genus, it has seemed desirable to draw up the following key to the species represented in the Kew Herbarium. *E. excelsum* has been omitted on account of the inadequate nature of the material. The synonymy and geographical distribution of the species have been given in *Kew Bull.*, 1910, pp. 179–181. Since that account was established three additional species have been described: *E. Rederi*, Harms in Notizbl. Bot. Gart. Berlin, vol. v. p. 184 (Cameroons); *E. speciosum*, Harms in Wiss. Ergebn. Deutsch. Zentral-Afr.-Exped.

1907–1908, vol. ii. p. 429 (Kwidjwi Island, Lake Kiwu); and *E. choriandrum*, Harms, l.c. 430 (Belgian Congo). None of these is represented at Kew. *E. Casimirianum*, De Wild. & Th. Dur., Ill. Fl. Congo, p. 126, is an alternative name for *E. Candolleanum*, De Wild. & Th. Dur.

Leaflets caudate ... ... *E. caudatum.*

Leaflets not caudate :—

Petiole much flattened at base; leaflets 6–9 pairs, firmly coriaceous, margins undulate; lateral nerves very prominent on the lower surface.

Leaflets obovate-oblong, distinctly cuspidate ... ... *E. Candollei.*

Leaflets oblong or elliptic-oblong, not cuspidate ... ... *E. ferrugineum.*

Above characters not combined :—

Leaflets cucullate-cuspidate :

Leaflets obovate to obovate-oblong ... ... *E. angolense.* / *E. macrophyllum.*

Leaflets elliptic to elliptic-oblong, cuspidate from an emarginate apex ... ... *E. septentrionale.*

Leaflets shortly acuminate :—

Leaflets glabrous; capsule cylindric ... ... *E. cylindricum.*

Leaflets with tufts of hairs in the axils of the nerves; capsule massively club-shaped ... *E. utile.*

T. A. S. and T. F. C.

Agricultural Department, Dominica.—The Report of the Dominica Agricultural Department for the year ending March 31st, 1912, is more than usually interesting, and is illustrated by some useful photographs taken in the Gardens.

Of introduced trees which have fruited for the first time may be mentioned the Durian and the Honduras Mahogany (*Swietinia macrophylla*). Teak grows well and seeds freely, and the African Mahogany *Khaya senegalensis* is found to thrive in a sheltered position.

The Lime industry in the island continues to flourish, and an additional acre of land has had to be added to the nurseries to provide room for meeting the largely increased demand for lime plants.

Trials with several Leguminous plants as green dressings were made, and *Tephrosia candida* gave very satisfactory results. It is recommended as being especially useful for rubber plantations since it keeps the soil clean from weeds.

Grafted Cacao is again reported on favourably, and good photographs of budded Cacao, taken six weeks after budding, are reproduced.

The Report also includes an interesting account of the efforts that are being made in the island to improve the Cacao cultivation among the peasant proprietors by visiting instructors.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 2.] [1913.

VI.—CONTRIBUTIONS TO THE FLORA OF SIAM.

Additamenta III.

Mitrephora trimera, *Craib* [Anonaceae-Mitrephoreae]; *M. Prainii*, King, facie similis sed foliorum nervis paucioribus, floribus fasciculatis haud solitariis 3-meris haud 4-meris distincta.

Arbuscula (ex *Kerr*), ramulis fuscis primo puberulis mox glabris vel fere glabris pauci-lenticellatis. *Folia* oblongo-oblanceolata, apice breviter obtuse acuminata, basi parum inaequalia, late cuneata vel cuneato-rotundata, 13–23·3 cm. longa, 4–9 cm. lata, chartacea, supra costa primo densius mox tenuiter strigillosa, subtus costa nervisque primo parcius adpresse strigillosa, mox fere glabra, nervis lateralibus utrinque 10–12 plerumque 11 supra conspicuis subtus prominentibus, nervis transversis supra subconspicuis subtus prominulis, petiolo validiusculo supra canaliculato ad 9 mm. longo fusco pubescente suffulta. *Flores* ♂ in fasciculos saltem 10-floros axillares vel ex axillis foliorum delapsorum ortos dispositi; pedicelli 1·3–1·7 cm. longi, medio vel paulo supra medium minute bracteolati, adpresse pubescentes. *Sepala* 3, transverse oblonga, rotundata, 1 mm. longa, 1·5 mm. lata, dorso breviter pubescentia. *Petala* exteriora 3, sepalis duplo longiora, dorso breviter pubescentia; interiora 3; unguis circiter 3 mm. longus; pars expansa late triangularis, circiter 4 mm. longa, 5·5 mm. lata, dorso breviter pubescens, intra glabra. *Stamina* numerosa. *Pistilla* deficientia.

Nan, Hui Sui, in evergreen jungle, 240 m., *Kerr*, 2421.

Alphonsea glabrifolia, *Craib* [Anonaceae-Miliuseae]; ab affini *A. Boniana*, Finet et Gagnep., foliis majoribus glabris, ovulis circiter 16 recedit.

Arbor circiter 9 m. alta (ex *Kerr*); ramuli primo tenuiter breviter adpresse ferrugineo-pubescentes, mox glabri vel subglabri, fusco-corticati, inconspicue pauci-lenticellati. *Folia* lanceolata vel oblongo-lanceolata, apice acuminata, obtusa, plerumque mucronulata, basi parum inaequalia, cuneata, vel late cuneata, 4·7–12 cm. longa, 1·5–3·8 cm. lata, chartacea, glabra, nervis lateralibus

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utrinque 9–11 intra marginem anastomosantibus supra conspicuis vel subprominulis subtus cum nervis transversis prominulis, petiolo circiter 3 mm. longo supra canaliculato indumento ut ramulis suffulta. *Pedunculi* plerumque oppositifolii, 3–4 mm. longi, abortu uniflori, indumento ut ramuli ; pedicelli pedunculo aequales vel eo paulo longiores, parvi-bracteolati, floribus albis (ex *Kerr*). *Sepala* 3, arcte recurvata, transverse oblonga, 1·75 mm. longa, 2·5 mm. lata, ciliolata. *Petala* exteriora apice obtusa, basi saccata, 13 mm. longa, 5·5 mm. lata, extra minute adpresse ferrugineo-pubescentia, intra superne praecipue puberula ; interiora apice obtusa, demum recurvata, inferne contracta, saccata, 12·5 mm. longa, 5 mm. lata, extra minute adpresse ferrugineo-pubescentia, intra glabra. *Receptaculum* convexum, setosum. *Stamina* circiter 4-seriata ; filamenta brevia, validiuscula ; antherae 1 mm. longae, breviter obtuse apiculatae. *Ovarium* cum stylo perbrevi 3 mm. altum, subsericeum, ovulis circiter 16 2-seriatis.

Near Rawng Kwang, Mê K'Mi, in evergreen jungle, 210 m., *Kerr*, 2370 (type of the species) ; Hui Ché, 300 m., *Luang Vanpruk*, 316.

Polygala cerviflora, *Craib* [Polygalaceae] ; ab affini *P. floribunda*, Dunn, fructuum alis altius emarginatis fissurae lateribus parallelis facile distinguenda.

Ramuli graciles, primo tenuiter pilosuli, mox glabri, angulati, pallide corticati. *Folia* oblanceolata vel late oblanceolata, parum inaequilatera, apice acute acuminata, basi in petiolum attenuata, 4–12 cm. longa, 1·2–3·8 cm. lata, tenuiter chartacea, supra fusca, subtus pallidiora, glabra, integra, nervis lateralibus utrinque 4–8 cum costa supra conspicuis subtus prominulis, nervulis supra subconspicuis ; petioli 1–2 cm. longi. *Racemi* axillares, oppositifolii et terminales, densiflori, ad 10 cm. longi, breviter pedunculati ; pedicelli sub anthesin 3 mm. longi, infructescentes 4 mm. longi, glabri ; bracteae deciduae, 3·5 mm. longae. *Sepala* 3 exteriora plus minusve cucullata, circiter 3·5 mm. longa, glabra, 2 interiora petaloidea, oblongo-oblanceolata, 2·6 cm. longa, 6 mm. lata. *Petala*, cum carinae crista fimbriata, 2 cm. longa, duobus posticis cum aliis ad 15 mm. connatis lobis oblongis apice rotundatis vix 5 mm. longis. *Ovarium* 1·5 mm. altum, stylo tenui 18 mm. longo. *Fructus* rotundatus, ad 9 mm. (ala 2 mm. lata inclusa) diametro.

Doi Intanon, Pah Ngeam, West side of North Peak, 2035 m., *Garrett*, 88.

Hypericum Garrettii, *Craib* [Hypericaceae-Hypericeae] ; ab affini *H. Hookeriano*, Wight et Arn., foliorum nervis numerosioribus, floribus haud congestis recedit.

Suffrutex glaber ; ramuli primo compressiusculi, mox teretes, cortice brunneo obtecti. *Folia* lanceolata vel oblongo-lanceolata, apice acuta, basi cuneata vel late cuneata, 1·7–4·2 cm. longa, 0·7–fere 2 cm. lata, chartacea, pellucido-punctata, punctis saepe elongatis, nervis lateralibus utrinque 6–8 intra marginem anastomosantibus, distincte sed perbreviter petiolata. *Flores* et solitarii, ramulos laterales 6–10 cm. longos terminantes et terminales, racemosim dispositi, pedicellis 5–7 mm. longis suffulti. *Sepala* elliptica, oblongo-elliptica vel obovato, apice rotundata, ad 9 mm. longa et

6 mm. lata, sub fructu praecipue distincte costata. *Petala* obovata, ad 2·2 cm. longa et 1·8 cm. lata, inferne contracta. *Stamina* in fasciculos 5 petalis oppositos connata ; filamenta 4·8 mm. longa ; antherae parvae. *Ovarium* 8 mm. altum, 5 mm. diametro ; styli 5, 7 mm. longi. *Fructus* 1·6 cm. altus, stylis persistentibus ; semina minuta.

Doi Intanon, among rocks on steep hillside, 2142–2165 m., *Garrett*, 67.

Pterospermum grandiflorum, *Craib* [Sterculiaceae - Helictereae] ; *P. truncatolobato*, Gagnep., facie persimile sed floribus haud semper solitariis partibus omnibus majoribus, staminodiis superne haud glabris, filamentis antheris fere quadruplo longioribus recedit.

Arbor, ramulis primo albo-tomentellis et parce brunneo-stellato-pubescentibus mox albido-tomentellis cortice cinereo-brunneo reticulato-striato obtectis. *Folia* 6·5–18 cm. longa, e basi truncata vel retuso-truncata parum inaequali 3·5 cm. lata lateribus ad apicem truncato-lobatum 4–11 cm. latum subaequaliter divergentibus, matura rigide chartacea, basi 3-nervata (vel 7-nervata, nervis inferioribus vix conspicuis), nervis secondariis (e costa ortis) utrinque 6–8 supra leviter impressis subtus valde prominentibus, nervis transversis supra conspicuis subtus prominentibus, pagina superiore glabra, inferiore minute albido-tomentella ; petioli ad 1·5 cm. longi, indumento ut ramuli ; stipulae deciduae. *Flores* axillares, plerumque bini vel terni, pedunculo communi valido ad 5 mm. longo suffulti ; pedicelli pedunculo subaequilongi. *Sepala* linearia, subacuta, ad 7 cm. longa, 5 mm. lata, extra tomentella, intra adpresse hirsuta. *Petala* alba (ex *Kerr*), linearia, basi apiceque attenuata, curvata, litteram S plus minusve simulantia, circiter 5 cm. longa, 5 mm. lata, glabra. *Androphorum* ad 1·2 cm. longum, 1·25 mm. diametro, glabrum. *Stamina* 15, in greges 5 cum staminodiis circiter 4 cm. longis superne tuberculatis parcissime pubescentibus alternantes disposita ; filamenta 2·5 cm. longa, glabra ; antherae obtuse apiculatae, 7 mm. longae, glabrae. *Ovarium* sessile, vix 5 mm. altum, dense albo-stellato-hirsutum ; stylus validus, staminodiis aequialtus, inferne stellato-hirsutus. *Fructus* valvae apice acuminatae, acutae vel subacutae, basi in stipitem validum circiter 2 cm. longum contractae, faciebus planae vel parum concavae, 8 cm. longae.

Chiengmai, Doi Sootep, in evergreen jungle, 660 m., *Kerr*, 1805.

Clausena Kerrii, *Craib* [Rutaceae-Aurantieae] ; a *C. leni*, Drake, petiolulis 2·5 mm. longis, ovario omnino glabro recedit.

Fruticulus ad 3 m. altus (ex *Kerr*) ; ramuli molliter breviter albo-pubescentes, ad 5 mm. diametro, fusco-corticati. *Folia* alterna, ad 14-foliolata, 50 cm. longa, petiolo ad 6·5 cm. longo terete indumento ut rachi ramulisque suffulta ; foliola alterna, inaequilatera, infima fere rotundata, suprema latere altero dimidio ovato-lanceolata, altero dimidio oblanceolata, apice acuminata, acuta, basi latere uno cuneata, altero attenuata, infima 4·6 cm. longa, 3·2 cm. lata, superiora ad 14 cm. longa et 6 cm. lata, pagina superiore costa nervisque praecipue breviter sparse pubescentia, inferiore molliter breviter albo-pubescentia, margine distanter serrulata, petiolulis brevibus suffulta. *Panicula* terminalis, racheos ramulorum pedicellorumque

brevium indumento ut ramulis ; bracteae circiter 1·5 mm. longae ; alabastra ovoidea, obtusa, conspicue glandulosa. *Sepala* crassa, ad 1 mm. longa, dorso parce pubescentia. *Petala* alba (ex *Kerr*), oblongo-ovata, 5 mm. longa, 2·75 mm. lata. *Filamenta* 0·75 mm. longa, antheris 3 mm. longis. *Ovarium* 1·25 mm. altum ; stylus 2·5 mm. longus, pilis perpaucis hic illic instructus.

Near Wieng Papao, Ban Ta Kaw, in evergreen jungle, 510 m., *Kerr*, 2514.

Aglaia meliosmoides, *Craib* [Meliaceae - Trichilieae] ; ab affini *A. submonophylla*, Miq., inflorescentia petiolo multo longiore recedit.

Frutex circiter 3 m. altus (ex *Kerr*) ; ramuli primo brunneo-furfuracei, conspicue lenticellati, mox cinereo-corticati, lenticellis vix conspicuis. *Folia* alterna, simplicia, oblanceolata, apice acuminata, obtusa, basi obtusa, 10–17 cm. longa, 3–5 cm. lata, integra, chartacea, matura utrinque glabra, nervis lateralibus utrinque 13–17 supra conspicuis vel subconspicuis subtus cum costa prominentibus, costa supra impressa, nervulis supra subconspicuis vel obscuris subtus prominulis, petiolo 2–3 cm. longo apice valde incrassato supra parte incrassata canaliculata suffulta. *Panicula* axillaris, plerumque circiter 8 cm. longa ; rachis ramulique conspicue rufo-stellato-pubescentes ; bracteae angustae, ad 3 mm. longae, dense rufo-pubescentes ; pedicelli ad 2 mm. longi, fere glabri. *Sepala* ad 1 mm. longa, ciliata, dorso superne pilis paucis rufis ornata. *Petala* lutea (ex *Kerr*), paulo ultra 1·75 mm. longa, 1·5 mm. lata. *Tubus* staminalis circiter 1·5 mm. longus, antheris vix exsertis. *Pistillum* 1 mm. altum ; ovarium adpresse albo-pubescens, stylo ovario breviore glabro.

Near Rawng Kwang, Me K'Mi, in evergreen jungle, 210 m., *Kerr*, 2369.

Allomorphia setosa, *Craib* [Melastomaceae-Oxysporeae] ; ob caules, petiolos foliorumque nervos pagina inferiore setis divergentibus instructos distincta.

Suffrutex ad 3 m. altus (ex *Kerr*) ; ramuli teretes, ad 3 mm. diametro, setis divergentibus circiter 2·5 mm. longis instructi. *Folia* ovato-lanceolata, apice indistincte acuminata vel attenuata, acutiuscula, basi rotundata, plerumque emarginata, 8·5–14 cm. longa, 3·5–6·8 cm. lata, chartacea, supra glabra vel setis hic illic parcissime instructa, subtus nervis nervulisque setis divergentibus rigidiusculis instructa, e basi 5-nervia, nervis supra conspicuis subtus prominentibus duobus infimis aliis paulo tenuioribus, nervis transversis parallelis inter se plerumque 3–7 mm. distantibus pagina superiore conspicuis inferiore prominulis et setosis ; petioli foliorum oppositorum inaequales, 1·3–3 cm. longi, teretes, ut caules setosi. *Panicula* ad 12 cm. longa et 2·5 cm. diametro ; pedicelli circiter 1·5 mm. longi. *Receptaculum* 3 mm. altum, angulatum. *Calycis* lobi breves. *Petala* 4, ad 2 mm. longa et 2·5 mm. lata. *Stamina* 8, inter se subaequalia, filamentis 3 mm. longis, antheris ad 2 mm. longis. *Stylus* 4 mm. longus. *Capsula* circiter 3 mm. alta, apice in collum 1 mm. altum producta.

Doi Wao, very common in evergreen jungle, 750–1050 m., *Kerr*, 2456.

Yunnan : Szemao, 1200 m., *Henry*, 12993.

Allomorphia subsessilis, *Craib* [Melastomaceae-Oxysporeae]; species foliis fere sessilibus basi inaequaliter auriculatis distincta.

Arbuscula circiter 4·5 m. alta (ex *Kerr*); ramuli quadrangulares, angulis, praecipue internodii apicem versus, alatis, ad 3 mm. diametro, fistulosi, hic illic parce breviter brunneo-pilosulo-pubescentes. *Folia* anguste oblongo-lanceolata, apice acuminata, acutiuscula, basi inaequaliter auriculata, 15·5–18·5 cm. longa, 3–4·2 cm. lata, supra minute brunneo-puberula, mox glabra, subtus nisi nervis primariis crispatim brunneo-pilosulo-pubescentibus fere glabra, e basi 5-nervia, nervis supra impressis subtus prominentibus, nervis transversis supra leviter impressis subtus prominulis, chartacea vel rigide chartacea, margine apicem versus distanter minute denticulata; petioli foliorum oppositorum parum inaequales, 2–3 mm. longi, crispatim brunneo-pubescentes. *Panicula* terminalis, ad 22 cm. longa, pedunculo communi circiter 6 cm. longo suffulta, ramis inferioribus 13 cm. longis, ramulis circiter 4 cm. longis; pedunculi cymas gerentes ad 1 cm. longi, quadrangulares, parce pubescentes; pedicelli teretes, circiter 2 mm. longi, puberuli. *Receptaculum* circiter 4 mm. altum, breviter puberulum. *Calyx* vix lobatus. *Petala* ad 2·75 mm. longa et 3 mm. lata. *Stamina* 8, inter se subaequalia, filamentis 2 mm. longis, antheris ad 3 mm. longis. *Stylus* vix 7 mm. longus, glaber.

Doi Wao, in evergreen jungle, 300–900 m., *Kerr*, 2427.

Gynostemma angustipetala, *Craib* [Cucurbitaceae-Gynostemmeae]; ab affini *G. integrifolia*, Cogn., petalis longioribus angustioribus recedit.

Caules primo puberuli, mox subglabri, rubro-brunnei, dein glabri, straminei, sulcati. *Folia* quinquefoliolata, petiolo 1–2·5 cm. longo puberulo supra canaliculato suffulta; foliola plerumque oblonga vel oblongo-oblanceolata, vel infima latere uno dimidiatim ovata, altero dimidiatim oblanceolata, apice subtruncata, mucronata, basi mediana attenuata, infima valde inaequilatera, latere altero rotundata vel fere truncata, altero attenuata, ad 8·5 cm. longa et 3 cm. lata, tenuiter chartacea, pagina utraque pilis brevibus, sed subtus costa nervisque densius, parce instructa, nervis lateralibus utrinque 4–5 obliquis intra marginem anastomosantibus cum costa pagina superiore impressis inferiore prominentibus, nervis transversis obscuris, integra, petiolulis usque ad 1 cm. longis suffulta. *Paniculae* ♂ folia superantes, pedunculo communi petiolo subaequali vel eo longiore puberulo suffultae, rachi ramulisque puberulis; bracteae angustae, 2–3 mm. longae; pedicelli graciles, ad 6 mm. longi; flores ad 6 mm. diametro. *Sepala* 5, lineari-lanceolata, acutissima, petalis subaequilonga iisque paulo latiora, ciliata, dorso parce pubescentia. *Petala* 5, sepalis conformia, 0·5 mm. lata, ciliata, dorso parce pubescentia. *Stamina* 5, connata, paulo ultra 0·5 mm. alta.

Chiengmai, Doi Sootep, in mixed jungle, 360 m., *Kerr*, 1332; Ban Pong, in mixed jungle, 390 m., *Kerr*, 1946.

Nyssa bifida, *Craib* [Nyssaceae]; a speciebus adhuc descriptis stylis bifidis recedit.

Ramuli primo subflavido-pubescentes, mox glabri, cortice brunneo pauci-lenticellato obtecti, ad 5 mm. diametro. *Folia* oblanceolata, oblongo-oblanceolata vel interdum obovato-elliptica, apice acute acuminata, basi cuneata vel late cuneata, 11–27 cm. longa, 5–11 cm.

lata, chartacea vel rigide chartacea, nervis lateralibus utrinque 12–17 fere rectis supra conspicuis subtus prominentibus, nervis transversis pagina superiore conspicuis inferiore subprominulis, supra, costa pubescente excepta, fere glabra, subtus costa nervisque pubescentia vel subglabra, petiolo 1·5–3·5 cm. longo supra planiusculo vel leviter canaliculato pubescente suffulta. *Inflorescentia* ♂ pedunculo communi circiter 1·5 cm. longo tomentello suffulta ; pedicelli ad 4 mm. longi, basi bracteati, adpresse pubescentes. *Calycis* lobi breves, extra adpresse pubescentes. *Petala* sub anthesin recurva, oblonga, apice rotundata, ad 2 mm. longa et 1·5 mm. lata. *Stamina* exteriora interioribus multo longiora, filamentis 3 mm. longis glabris. *Discus* carnosus, glaber. *Capitula* ♀ pedunculo communi 2–3 mm. longo tomentello paulo supra medium bracteato suffulta. *Receptaculum* 4 mm. altum, 3 mm. diametro, adpresse pubescens. *Calyx petalaque* maris sed minora. *Ovarium* unilocular e ; stylus 1·5 mm. altus, ramis 2 stylo subaequilongis. *Fructus* subellipsoideus, ad 1·2 cm. longus, fusco-brunneus, parce pubescens.

Chiengmai, Doi Sootep, in evergreen jungle, 660–900 m., *Kerr*, 1713, 1716, 2594.

Lao name, Mai kŭng kak ? (ex *Kerr*).

Jasminum siamense, *Craib* [Oleaceae-Jasmineae] ; ob calycis lobos lineares acute acuminatos ad 9 mm. longos minutissime tantum puberulos distinctum.

Ramuli graciles, primo puberuli, virides, mox minutissime puberuli, cortice stramineo subnitido obtecti. *Folia* lanceolata, late lanceolata vel ovato-lanceolata, ad apicem mucronatum plerumque gradatim attenuata, basi cuneata vel late cuneata, 3·5–8·5 cm. longa, 2–2·7 cm. lata, membranaceo-chartacea vel fere chartacea, glabra vel superne minute ciliolata, nervis lateralibus utrinque 3–4 supra subconspicuis subtus prominentibus, nervis transversis obscuris, petiolo 4–7 mm. longo minute puberulo vel fere glabro suffulta. *Flores* terminales, solitarii ; pedicelli circiter 6 mm. longi. *Calycis* tubus 2·5 mm. altus, lobi 6, lineares, acuminati, acuti vel acutiusculi, 7·5 mm. longi, 1·75 mm. lati, minutissime puberuli, apicem versus minute ciliolati. *Corolla* alba (ex *Kerr*) ; tubus 1·6 cm. longus ; lobi acuti, ad 2·5 cm. longi et 4 mm. lati. *Antherae* mucronatae, circiter 4·5 mm. longae, fere sessiles. *Ovarium* depresso-globosum, 1 mm. altum, fere 2 mm. diametro.

Between Lăkawn and Prê, Ban Mê Ta, in scrub jungle, 450 m., *Kerr*, 2307.

Lao name, Dawk seo (ex *Kerr*).

Holarrhena similis, *Craib* [Apocynaceae - Euplumerieae] ; *H. Curtisii*, King et Gamble, facie similis sed foliis calycisque lobis majoribus recedit.

Fruticulus 60–90 cm. altus (ex *Kerr*), ramulis primo parce breviter pilosulis mox glabris cortice rubro-brunneo pauci-lenticellato reticulato-striato obtectis ad 6 mm. diametro. *Folia* plerumque oblonga, rarissime elliptico - ovata, apice plerumque rotundata, breviter acuminata, basi rotundata vel leviter cordata, 7–10 cm. longa, 4·5–6·2 cm. lata, chartacea vel chartaceo-coriacea, pagina utraque breviter molliter pubescentia, mox superiore puberula, subtus pallidiora, nervis lateralibus utrinque circiter 13 intra marginem anastomosantibus supra cum costa nervulisque leviter

impressis subtus cum costâ prominulis, nervis transversis uti reticulatione subtus conspicuis vel fere subprominulis; petiolo 1–3 mm. longo suffulta. *Inflorescentia* generis; pedicelli circiter 13 mm. longi. *Calycis* segmenta fere 5 mm. longa, basi 1·5 mm. lata, obtusiuscula, ciliolata, dorso ut pedicelli pubescentia, intra superne parce breviter pubescentia; glanduli lobis alterni, parvi. *Corollae* albae (ex *Kerr*) tubus 1·2 cm. longus, extra, ima basi excepta, puberulus; lobi ad 2 cm. longi et 5·5 mm. lati. *Antherae* 1·25 mm. longae, apiculo circiter 0·75 mm. longo coronatae; filamenta antheris breviora, circiter 1·5 mm. e tubi basi affixa. *Ovarium* circiter 1 mm. altum, disco parvo; stylus 1·5 mm. longus. *Folliculi* ad 29 cm. longi, rubro-brunnei, lenticellati, striati, glabri.

Lămpun, Mê Ta, in eng jungle, 450 m., *Kerr*, 2548; Prê, near Rawng Kwang, in open spaces in deciduous jungle, 180 m., *Kerr*, 2357.

Lao name, Mai muk (ex *Kerr*).

Didymocarpus squamosa, *Craib* [Gesneraceae-Cyrtandreae]; *D. Kerrii*, Craib et *D. purpureo-pictae*, Craib, affinis, ab ambabus foliis subtus costa nervisque pilis rigidioribus squamiformibus tectis foliisque duplo-serratis recedit.

Herba perennis, caulescens, 6–14 cm. alta; caulis nodis plerumque satis distantibus albo-pilosulus praetereaque pilis longioribus divaricatis praesertim ad nodos instructus, pilis omnibus primo albidis mox brunnescentibus. *Folia* opposita interdum subaequalia, plerumque valde inaequalia, oblonga, elliptico-ovata vel fere elliptica vel subrotundata, 2·3–7·3 cm. longa, 2–5·2 cm. lata, chartacea vel membranaceo-chartacea, pagina superiore primo albo-pilosa, mox brunneo-pilosa, inferiore praesertim ad costam nervosque pilis compressis squamiformibus brunneis densius instructa, ceterum pilosa, parce aureo-glandulosa, nervis lateralibus utrinque 4–5 supra conspicuis subtus prominulis, nervulis subtus conspicuis, margine duplo-serrata vel duplo-crenato-serrata; petioli foliorum oppositorum plerumque inaequales, plantae humilioris ad 2 cm. longi, plantae normalis (vel saltem partis majoris plantarum adhuc collectarum) ad 7 cm. longi. *Inflorescentia* terminalis, pedunculis pilis divaricatis glanduliferis parce instructis exceptis glabra; bracteae glabrae, 3·5 mm. longae, 4 mm. latae. *Calycis* glabri tubus 3 mm. longus, lobi oblongi, apice rotundati vel acutiusculi, 1·5 mm. longi, 1·5 mm. lati. *Corollae* tubus 1·6 cm. longus, limbus 6 mm. longus. *Stamina* glabra, filamentis 3 mm. longis. *Pistillum* 1·7 cm. longum; discus tubularis, stipitis basin cingens, 2 mm. altus. *Capsula* acuminata, ad 2·5 cm. longa.

Chiengmai, Doi Sootep, on damp rocks in evergreen jungle, 900 m., "corolla tube mauve, limb purple," *Kerr*, 2636.

Cleistanthus siamensis, *Craib* [Euphorbiaceae-Phyllantheae]; ab affini *C. malabarico*, Muell.-Arg., ramulis eorumque indumento conspicue tenuioribus facile distinguendus.

Ramuli graciles, primo ferrugineo-tomentosi, mox puberuli vel subglabri, pauci-lenticellati. *Folia* oblongo-lanceolata, oblanceolata vel oblongo-oblanceolata, apice acuminata, obtusa vel acuta, basi inaequalia, plerumque late cuneata, ima basi latere utroque auriculata, 4·5–14 cm. longa, 1·3–4·6 cm. lata, chartacea, juventute pagina inferiore pilosula, superiore costa parce ferrugineo-hirsuta,

mox glabra, nervis lateralibus utrinque 9–11 intra marginem anastomosantibus supra conspicuis subtus prominulis, nervis transversis pagina utraque conspicuis ; petioli validiusculi, 3 mm. longi, puberuli vel breviter pubescentes ; stipulae deciduae, 5–6 mm. longae, basi vix 1 mm. latae. *Inflorescentia* axillaris, glomerata. *Flos* ♂. *Calycis* carnosi tubus 1·25 mm. longus, lobi inter se subaequales, 2 mm. longi, vix 1 mm. lati. *Petala* parva, transverse oblonga, longe cuspidato-acuminata vel tricuspidata. *Stamina* 5, filamentis ima basi connatis ovarii rudimentum cingentibus. *Flos* ♀. *Calyx* corollaque maris sed calyce parum majore. *Ovarium* 1·5 mm. altum, dense adpresse albo-hirsutum.

Srirăcha, 4·5 m., *Mrs. D. J. Collins*, 16.

Phyllanthus Collinsae, *Craib* [Euphorbiaceae - Phyllantheae] ; *P. polyphyllo*, Willd., facie similis ovario conspicue verrucoso facile distinguenda.

Ramuli graciles, glabri, lignosi, fusco-corticati ; ramuli ultimi alterni, graciles, recti, folia pinnata simulantes, ad 18 cm. sed plerumque 7–10 cm. longi, glabri. *Folia* oblonga, apiculata, basi inaequalia, late cuneata vel rotundato-cuneata, 1–2 cm. longa, 3–5 mm. lata, ápicem versus ramulorum gradatim breviora, tenuiter chartacea, utrinque glabra, subtus pallidiora, nervis lateralibus utrinque 9–10 intra marginem anastomosantibus pagina superiore obscuris vel subobscuris inferiore conspicuis, margine revoluta, petiolo perbrevi suffulta. *Ramuli* ultimi floriferi, androgyni, inferne in foliis normalibus flores masculos vel interdum superne et flores paucos femineos gerentes, summo apice aphylli vel subaphylli, flores femineos et interdum flores paucos masculos gerentes. *Floris* masculi pedicelli pergraciles, 2–3 mm. longi, glabri. *Sepala* 6, inter se subaequalia, 1 mm. longa. *Columna* staminalis 1·5 mm. alta ; antherae 3, vix 0·5 mm. longae. *Pedicelli* floris feminei 4 mm. longi, pedicellis maris valde robustiores. *Sepala* 6, 3 exteriora 1·75 mm. longa, 0·75 mm. lata, interiora 2 mm. longa, 1·25 mm. lata. *Discus* parvus, margine fimbriatus. *Ovarium* 1·5 mm. altum, valde verrucosum ; styli 3, liberi, bifidi.

Srirăcha, 4·5 m., *Mrs. D. J. Collins*, 12, *Kerr*, 2036.

VII.—MAHOGANY BORERS OF THE GOLD COAST.

T. F. Chipp.

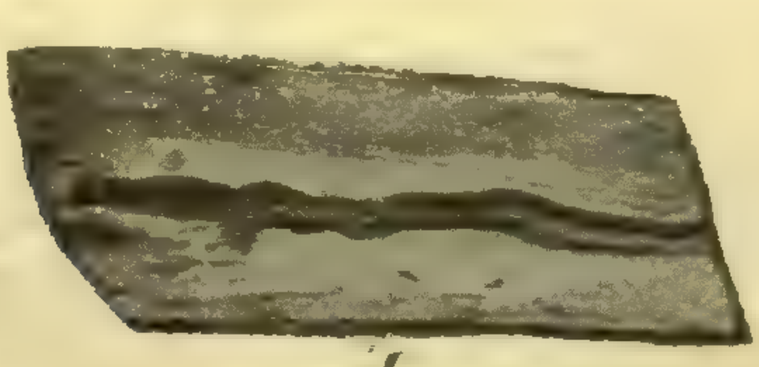
The general method of timber extraction on the Gold Coast is for a tree, after being felled and cut into logs, to be hauled by manual labour to the nearest stream. The logs are then floated down and collected into rafts at the mouths of the main rivers.

In 1912 the abnormal summer in England was reflected on the Coast in an unusually low rainfall and high tides, particularly during the month of August. Owing to the small volume of water coming down, the river currents were not very strong and, the tides being high, most of the rivers obtained free access to the sea for a short time only, after which the sand bars again closed across their mouths. It was exceedingly difficult, on this account, to take any rafts out to

sea and anchor them in the beach coves to await shipment as is the usual custom. When the number of logs was greatest, about the beginning of August, the presence of worm borers was reported.

Occurrence.—Enquiries amongst local timber firms and of natives elicited the facts that worm borers have appeared at any rate for the last seven years and probably long before that, although their numbers and the extent of the damage done varies with the seasons. All are agreed, however, that the attack which began this year in August has been far worse than any that can be remembered. Each river mouth where logs had been collected was reported to show the same conditions, namely, a slow river current, a sand bar, and a fringe of the mangrove association, and, with one exception, all logs in such localities were bored. The one exception was afforded by some logs anchored at a spot in the Ancobra River mouth where no mangrove existed.

In former years, as now, the worms first appeared between the big and the small rains when the river current is sluggish and tides are high. In the case of those logs which were up river when the outbreak occurred no signs of bores were reported. Similarly those logs that were taken straight out to sea were found to have escaped, and in those that had been attacked the borers were reported to die on exposure to sea water.



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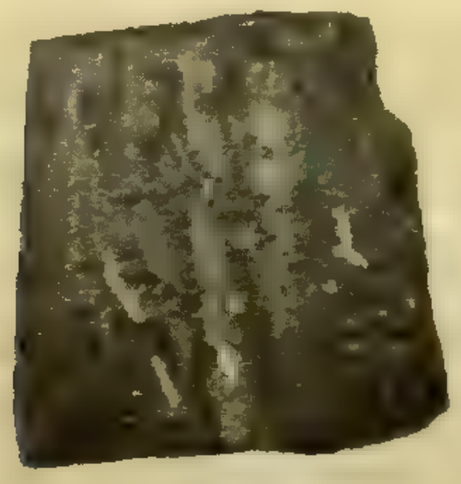

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1 and 2. Longitudinal sections of a mangrove stem, showing burrows made by *Teredo*.
3. A *Teredo* measuring 29 inches long.
4. Tangential longitudinal section of mahogany log, showing *Xylotra*.
5. Transverse section of same.
6. Radial longitudinal section of same.

The majority of the representatives of local timber firms were of the opinion that old and new timber was attacked equally. Some, however, stated that old logs were attacked worse than new, whilst others again thought that the new only were attacked. Barked or unbarked timber fared equally badly, and a steam launch belonging to the Mengel Mahogany Company, which was built of European timber, had to be protected with a metal covering.

In some cases the rate of boring was stated to depend on the age of the worm or to vary with the hardness of the timber. All were agreed, however, that it was about $\frac{1}{8}$ inch daily.

On 4th October, in company with Dr. R. O. White and Mr. Langton of Messrs. Rusts, a visit was made to the Ancobra River mouth. The part examined extended about one mile from the beach, the water was tidal and distinctly brackish, there was a slow river current, and along both river banks a fringe of mangrove. Considerable numbers of rafts were lying in the river chained up to the mangrove and all logs examined were found to be attacked.

On 7th October the mouth of Prince's River was examined in company with the Mengel Mahogany Company's representative stationed there. As in the case of the Ancobra the river was completely closed by a sand bar and there was consequently hardly any current. There is an extensive mangrove formation extending at least a mile up river, and the water was decidedly brackish. Solid mahogany logs lying near the mouth of the river and which were stated to have been there at least two seasons were perfectly honeycombed and could easily be broken up by hand. Logs of *Eriodendron anfractuosum* lying in the water were also found to be attacked. Dead branches of shrubs lying in the river were all found bored, but with no recent traces of borers.

On the 11th of October the Butre River was examined. This resembled the other rivers in being barred, in having a mangrove association in brackish water, and but little current. All logs lying in the river were found to be attacked. Some poles that had been washed into the river from a shipwreck, and which appeared to be of Scots Pine, were attacked similarly to native timber.

The Butre River was examined above the mangrove association on 12th October; the water here was fresh, there was a fair current and there were no traces of worm-borers.

Time did not permit for a visit to be paid to any other rivers, but a report received from Half Assinie stated that no logs were observed to have been attacked by borers. It is necessary to state that at Half Assinie the Tano River approaches to within two and a quarter miles of the coast and then turns westwards and does not communicate with the sea till some time after entering the French Ivory Coast. At the place referred to, therefore, there is a strong river current, fresh water, and no mangrove.

After the visit to the Ancobra River a few experiments were attempted, but owing to the difficulty of extracting the borers from the logs, on account of the sinuous character of the burrows, they are not altogether reliable. The experiments, which were conducted on an open verandah near the sea and exposed to indirect sunlight, gave the following results.

Pieces of timber containing borers were immersed in sea water, brackish water and rain water. Those borers which were exposed to pure sea water turned brown within two hours of submersion, and in fifteen hours were in a high state of decomposition. Those immersed in pure rain water appeared to die within six hours and had begun to decompose in fifteen hours. The control experiment in brackish

water which had been taken from a worm-infested locality showe that the worms had undergone little change, if any, in fifteen hours

It would appear that three factors are associated with the presence of borers. They are a sluggish river current, a certain mixture of salt and fresh water, and the presence of the mangrove formation. The two latter factors are intimately connected, but the absence of the first is sufficient to prevent borers appearing in any quantity, probably owing to the fact that the river current carries away the young fry.

The borer belongs to the genus *Xylotrya*, which differs from *Teredo* in the construction of the palet, and is probably a new species. It enters the log from its stage as a free swimming fry by a minute hole and bores its way into the wood, quickly enlarging the size of the bore till it measures about $\frac{1}{8}$ inch in diameter. At this stage the borers do not exceed ten inches in length. No general direction is followed, but in no case was any indication seen of connections between neighbouring burrows.

Mr. E. A. Smith of the British Museum has kindly identified the borer.

Suggested Methods of Protection.—In view of the large pecuniary loss sustained by some timber firms this year a method of protecting the logs would be welcomed.

Mr. R. S. Pearson, Forest Economist to the Indian Government, states in the Indian Forest Records iii., 2, that there is no antiseptic treatment yet discovered that can be recommended as an effective prevention of these borers.

Local observation shows that the natives' canoes are never attacked. In this case the canoes are always hauled out of the water when not in use, but such a proceeding with large rafts is hardly practicable. It suggests, however, the advisability of selecting for anchorage those stretches along the river bank where there is no mangrove. Observation of a raft belonging to the Talge Mahogany Company showed that logs anchored for three months in the Ancobra mouth at a spot where there was no mangrove had hardly any bore holes, although the river above this place was full of infested logs.

It can only be recommended, therefore, that when it is impossible to take rafts out and anchor them at sea, they should not be tied to mangrove, and if possible they should be hauled out of the water.

Whilst investigating the rafts of logs the mangrove trees were also examined. All the larger roots and stems were found bored below high-water level, and in some cases the borers had travelled at least six feet inside the stem. On cutting across a burrow above a borer a white watery fluid exuded freely. These borers measured from one to nearly three feet in length and had a bore with a diameter of $\frac{1}{2}$ to $\frac{5}{8}$ inch. Mr. E. A. Smith has identified them as an undescribed species of *Teredo*, specimens of which were previously collected by Sir Alfred Moloney in Lagos about 1891.

VIII.—DIAGNOSES AFRICANAE: LII.

1421. **Arabis albida,** *Stev.*, var. **elata,** *Sprague* [Cruciferae]; habitu elato, foliis caulinis superioribus ligularibus parvidentatis a typo recedit.

Herba 4–6 dm. alta, erecta vel inferne subascendens. *Folia* caulina inferiora ligulari-oblanceolata vel anguste oblanceolata, circiter 6 cm. longa, 1·2–1·3 cm. lata, parvidentata; folia superiora ligularia, 3·5–6·5 cm. longa, 0·8–1 cm. lata, basi sagittato-auriculata. *Glandulae disci* valvariae (laterales) obtusae vel rotundatae, iis typi breviores. *Pedicelli fructiferi* patentes, 1·5–1·7 cm. longi. *Siliquae* 2·5–5 cm. longae, stigmate sessile terminatae.

Tropical Africa. Uganda: Mt. Ruwenzori, 3600–3900 m., *Dawe*, 589. *Doggett*. Ruwenzori; Mabuka Valley, *Kässner*, 3135. German East Africa: Mt. Kilimanjaro, 2400–3300 m., *Johnston*, 23, 141.

The type of the new variety is Dawe's No. 589.

1422. **Strephonema apolloniensis,** *J. J. Clark* [Combretaceae]; species *S. sericeae*, Hook. f., affinis, sed inflorescentiis simplicibus, foliis et floribus majoribus, antheris multiseptatis, tomento coarctato differt.

Arbuscula sempervirens, ramulis teretibus longitudinaliter striatis breviter pubescentibus. *Folia* alterna, elliptica, apice subacute cuspidata, basi rotundata, 18·5–27 cm. longa, 6–8 cm. lata, coriacea, supra glabra, infra in costa et nervorum axillis pilis coarctatis bifurcatis rufo-brunneis pubescentia, nervis lateralibus utrinque 9–11 prominentibus obliquis, venis infra distinctis subparallelis; petioli 1 cm. longi, pilis rufo-brunneis obtecti. *Flores* in racemos axillares 4–7 cm. longos dispositi. *Racemi* pilis rufo-brunneis obtecti; bracteae 3–4 mm. longae, lanceolatae, concavae, 4 mm. longae. *Calycis tubus* campanulatus, 5 mm. longus, extra breviter pubescens, intra glaber; lobi 5, late triangulares, intra apice tomentosi, 3 mm. longi, 4 mm. lati. *Petala* 5, oblonga, apice rotundata et inflexa, 7 mm. longa, 3 mm. lata, ciliata. *Stamina* 10, 2-seriata, longe exserta, exteriora petalis opposita, antherae versatiles, triangulares, transverse multiseptatae, 1·5 mm. longae; filamenta filiformia, 1–1·5 cm. longa. *Ovarium* subglobosum, calycis tubo semi-adnatum, uniloculare, 3 mm. longum; ovula 2, sub apice loculi pendula; stylus 1·6 cm. longus. *Fructus* non visi.

Tropical Africa. Gold Coast: North Kwanta; W. Apollonia, small tree in tall evergreen forest, *Chipp*, 332.

1423. **Combretum** (Grandiflorae) **tarquense,** *J. J. Clark* [Combretaceae-Combreteae]; species *C. hispido*, Laws., affinis, sed foliis et floribus minoribus, inflorescentia simpliciore differt.

Frutex scandens, ramis novellis glanduloso-hispidis adultis lignosis glabrescentibus. *Folia* opposita, oblonga, basi truncata, apice gradatim vel cuspidatim acuminata, 8–12 cm. longa, 2–4 cm. lata, glabra, subtus pallidiora, nervis lateralibus utrinque 6–7 supra paulo immersis infra prominentibus intra marginem anastomosantibus, venis infra distinctis; petioli hirti, 3–4 mm. longi, basi geniculata et persistente. *Flores* rubri in spicam terminalem dispositi; rhachis

spicae 5–7 cm. longa, rufo-hirta; bracteae subulatae vel lanceolatae, 7·5 mm. longae, extra tomentosae, marginibus incurvis. *Calycis dentes* 5, late triangulares, 1 mm. longi, ciliati. *Petala* 5, oblonga, apice obtusa, 2·5 mm. longa, 2 mm. lata, glabra. *Stamina* 10, longe exserta; filamenta 6 mm. longa; antherae oblongae, versatiles, 5 mm. longae. *Receptaculum* inferum elongato-fusiforme, 3·5 mm. longum, superum 2·5 mm. longum, late campanulatum, extra parce pubescens, inferne intra glabrum, superne intra pilosum. *Fructus* non visi.

Tropical Africa. Gold Coast: Suku Suku, *Chipp*, 10; Tarkwa, *Thompson*, xliii.

1424. **Stephanorossia Elliotii**, *J. J. Clark* [Umbelliferae-Laserpitieae]; species *S. palustri*, Chiov., affinis sed caulibus floriferis flaccidis, involucri et involucelli bracteis, fructus magnitudine differt.

Herba. Caules floriferi flaccidi. *Folia* triternata, segmentis ultimis ovatis glaberrimis membranaceis argute serratis vel inciso-serratis basi rotundatis apice acutis 12 mm. longis 6–10 mm. latis; vagina 1–1·5 cm. longa. *Umbellae* axillares; pedunculi 1·4–3 cm longi. *Involucrum* ex bractea solitaria lineari 1 cm. longa constitutum; radii 5 vel 6, 1–1·2 cm. longi. *Bracteae involucelli* linearifiliformes, acutae, 5·5 mm. longae. *Flores* umbellularum 8–14, pauci aliquando steriles; pedicelli 1–2 mm. longi. *Calycis dentes* lineares, acuti, 0·5 mm. longi. *Petala* apice incurvata, minuta, 0·75 mm. longa. *Fructus* 2 mm. longi, 1·5 mm. lati, commissura (parte contigua) 1 mm. lata.

Tropical East Africa. Ruwenzori: by a small stream on rocks. 317 m., *Scott-Elliot*, 7791.

The genus *Stephanorossia* was published in 1911 by *Dr. Chiovenda* in *Annali di Botanica* (vol. ix. p. 65). It is founded on material collected in Abyssinia (*S. palustris*, Chiov.) which, from the description, seems to be identical with No. 372 of Mr. G. S. Baker's collection—said to grow in stream beds and marshy places at Mau.

1425. **Conopharyngia Chippii**, *Stapf* [Apocynaceae-Tabernaemontanoideae]; ab omnibus species sectionis *Sarcopharyngiae* magnitudine florum et tubo longo crassissimo facile distincta.

Arbor parva, glaberrima, 5–6 m. alta. *Folia* lanceolata vel lanceolato-oblonga, basi acuta vel subacuta, apice breviter acuminata, 18–25 cm. longa, 5–8 cm. lata, papyracea, nervis utrinque 8–10; petiolus 1 cm. lougus; stipulae intra-petiolares obtusissimae, breves. *Inflorescentiae* subcorymbosae; pedunculus crassus, circiter 7 cm. longus; bracteae superiores ovatae, minutae; pedicelli robusti, 1·5–2·5 cm. longi. *Calyx* 2 cm. longus; sepala latissime ovata, obtusissima, marginem versus tenuia, minute ciliolata, intus basi glandibus numerosis parvis stipata. *Corolla* cremea; tubus subcylindricus, medio paulo dilatatus, 7–8 cm. longus, infra stamina tenuis, supra ea crassissime carnosus via angustissima, intus praeter lineas 5 pubescentes glaber; limbi lobi oblique late ovati, obtusi, vix 2 cm. longi, glabri. *Stamina* paulo infra medium inserta, antherae 2·5 cm. longae, brevissime sagittatae. *Stylus* 3 cm. longus;

stigma cylindricum, 8–9 mm. longum, basi annùlatim incrassatum. *Ovarium* sensim in stylum abeuns ; ovula pluriseriata, numerossissima.

Tropical Africa. Gold Coast : Gemma, near the western frontier, in moist evergreen forest, *Chipp*, 353.

1426. **Ervatamia Methuenii**, *Stapf et M. L. Green* [Apocynaceae-Tabernaemontaneae] ; affinis *E. modestae*, Stapf (*Tabernaemontanae modestae*, Baker), sed foliis lanceolatis magis gradatim acuminatis, floribus fere duplo minoribus.

Frutex glaberrimus, ramis teretibus. *Folia* lanceolata, sensim acuminata, basi acuta, 4–5·5 cm. longa, 1–1·3 cm. lata, vix coriacea, nervis lateralibus tenuissimis utrinque circiter 10 obliquis, subtus pallida. *Inflorescentia* cymosa, alaris, pauciflora, laxa, pedunculo 5–12 mm. longo, bracteis scariosis parvis citissime deciduis, pedicellis gracilibus ad 5 mm. longis. *Calyx* 1 mm. longus ; sepala ovato-rotundata, obtusa, eciliolata, basi intus circiter 5 glandulis munita. *Corolla* alba vel in sicco lutescens, tubo cylindrico glabro nisi intus infra stamina minute puberulo 4 mm. longo, 1 mm. diametro, lobis oblongis circiter 4 mm. longis. *Stamina* circiter 2 mm. supra basin inserta, inclusa ; antherae a stigmate liberae, subsagittatae, cum brevissimis appendicibus ad 1·5 mm. longae. *Ovarium* glabrum ; stylus circiter 2·5 mm. longus ; stigma basi annulo cinctum, viscosum, oblongo-cylindricum, bifidum, lobis papillosis lanceolatis.

South Madagascar. Near Beloha, *Methuen*.

1427. **Serruria Bolusii**, *Phillips et Hutchinson* in Dyer, Fl. Cap. vol. v., p. 662, anglice [Proteaceae-Proteae] ; affinis *S. adscendenti*, R. Br., sed bracteis costatis glabris, pedunculis ultimis glabris differt.

Caules erecti ; rami glabri. *Folia* pinnatim vel bipinnatim dissecta, glabra, 2–4·5 cm. longa, segmentis ultimis anguste cylindricis acute mucronatis 0·8–1 cm. longis. *Capitula* 4–12, in pedunculo communi corymbosim disposita ; pedunculus 2 cm. longus, bracteis lineari-lanceolatis glabris 5 mm. longis demum reflexis instructus ; pedunculi ultimi 4–6 mm. longi, glabri, basi unibracteati. *Bracteae floriferae* ovatae, longe acute acuminatae, 3–6 mm. longae, costatae, glabrae vel minutissime pubescentes. *Flores* in alabastro curvati. *Perianthii tubus* 1·5 mm. longus, superne pubescens, inferne glaber ; segmenta 5–6 mm. longa, breviter appresse hirsuta ; limbus oblongus, subacutus, circiter 2 mm. longus, appresse hirsutus. *Antherae* 1·5 mm. longae. *Squamae hypogynae* 1–1·5 mm. longae, filiformes. *Ovarium* ellipsoideum, albo-pilosum ; stylus 6–7 mm. longus, basi incrassatus et articulatus ; stigma cylindricum, obtusum, sulcatum, vix 1·5 mm. longum. *Fructus* oblongo-ellipsoidei, rostrati, 5 mm. longi, villosi.

South Africa. Coast Region : Bredasdorp Div. ; near Elim, *Bolus*, 8589, *Schlechter*, 9651 partly ; without precise locality, *Thom*, 787.

1428. **Thesium Rogersii**, *A. W. Hill* [Santalaceae] ; species *T. gracile*, A. W. Hill, affinis, sed caulibus crassioribus floribus majoribus in racemis dispositis, antheris stylisque longioribus praecipue differt.

Suffrutex, caules numerosi, erecti, superne ramosi, 15-20 cm. alti, conspicue angulati et sulcati. *Folia* inferne squamiformia, superne linearia vel lineari-lanceolata, acuta, 0·6–1 cm. longa, apice brunnea. *Inflorescentia* terminalis, racemosa ; flores sessiles, singuli, rarius in cymas 3-floras in axillis bracteae dispositi ; bracteae anguste ovato-lanceolatae, acutae, carinatae, carnosulae, 4 mm. longae, floribus aequilongae, bracteolae 2, circiter 3 mm. longae. *Perianthium* 3·5 mm. longum, segmentis 2 mm. longis elliptico-lanceolatis cucullatis apice dense barbatis. *Antherae* 0·75 mm. longae. *Stylus* 1·25 mm. longus, medio antherarum attingens. *Fructus* ovoideus, 3–4 mm. longus, costis 10 conspicuis reticulationibus tenuibus instructus.

Tropical Africa. S. Rhodesia : Victoria Falls ; Candahar Island, 915 m., *Rogers*, 5467.

1429. **Croton subgratissimus**, *Prain* [Euphorbiaceae-Crotoneae] ; species *C. gratissimo*, Burch. et *C. Welwitschiano*, Muell. Arg., quam maxime affinis ab ambabus tamen foliis supra persistenter stellato-puberulis facillime distinguenda.

Arbuscula 1–4-metralis ; rami saepissime ternatim verticillati ; ramuli angulati, lepidoti ; cortex aromaticus. *Folia* trita fragrantia, alterna, in apice ramulorum subapproximata, distincte vel longe petiolata, coriacea, penninervia, ovato-lanceolata, acuminata, apice ipso emarginata, basi minutissime cordata, margine integra, 3-9 cm. longa, 1·25–3 cm. lata, supra crebre persistenter stellato-puberula, subtus lepidibus argenteis hinc inde medio fuscis vestita ; nervi laterales utrinsecus 12–14, supra visibiles nec tamen impressi nec elevati, subtus haud visibiles ; nervus medius supra impressus, subtus elevatus ; petiolus canaliculatus, lepidotus, 1–3·5 cm. longus apice glandulis 2 sessilibus instructus ; stipulae subulatae, lepidotae, saepissime perparvae, nonnunquam 5–6 mm. longae. *Racemi* terminales, androgyni ; rhachis lepidota ; bracteae 4-florae, subulato-lanceolatae, 1 mm. longae, lepidotae ; pedicelli 3 mm. longi, lepidoti. *Flores* utriusque sexus alabastro globosi, extra lepidoti. *Calyx maris* profunde 5-partitus, lobis ovatis obtusis intus pubescentibus. *Petala* 5, ovata, obtusa, extra parce lepidota, margine villosa, intus ceterum glabra. *Stamina* 15–20 ; filamenta parce pubescentia ; receptaculum pilosum ; glandulae disci crassae, glabrae. *Calyx feminei* ei maris simillimus. *Petala* 5, oblongo-lanceolata, obtusa, extra lepidota, intus hirsuta. *Discus hypogynus* perparvus. *Ovarium* dense lepidotum, 3-loculare, loculis 1-ovulatis ; styli patentes 6–8-partiti, glabri. *Capsula* parum 3-lobum, 8–9 mm. longum, dense lepidotum. *Semina* laevia.

Tropical Africa. Lower Guinea : German South-west Africa ; Hereroland, Okahandja, 1340–1675 m., *Hopfner*, 44, *Marloth*, 1354, *Dinter*, 229 ; Otjivazandu, *Rautanen*, 571 ; Ombika, *Rautanen*, 572.

Mozamb. Dist.: Tropical Western Bechuanaland ; Olifant's Kloof, *Fleck*, 452a, 453a.

South Africa. Kalahari Region : Temperate Bechuanaland ; Lobatsi, *Marloth*, 3331. Transvaal ; Macalisberg, *Engler*, 2767 ; Wonderboompoort, near Pretoria, *Rehmann*, 4552, *Leendertz*, 270, *Rogers*, 233, *Burtt Davy*, 1849, *Fehr*, 54.

This species is very nearly related to *C. Welwitschianus*, Muell. Arg. in Journ. Bot. i. 338 (Nov. 1, 1864), which is included in *C. zambesicus*, Muell. Arg. in Flora, xlvii., 483 (Oct. 5, 1864). The only tangible difference between the two species proposed by Müller is that in *C. Welwitschianus* the stipules are only 2–3 mm. long, whereas in *C. zambesicus* they are 4–6 mm. long. Much the same difference is met with in *C. subgratissimus*, the specimens from the Transvaal having stipules 4–5 mm. long, those from Bechuanaland and Hereroland having stipules 2 mm. long or less. *C. subgratissimus*, while most nearly related to *C. zambesicus*, owing to the texture of its leaves, bears a greater general resemblance to *C. gratissimus*, Burch. From both of these species, however, it is at once distinguished by having the upper surface of the leaves persistently stellate-puberulous instead of glabrous.

1430. **Droguetia Thunbergii**, *N. E. Brown* [Urticaceae-Urticeae]; affinis *D. diffusae*, Wedd., sed foliis crenatis subtus glabris, involucro intra lanato et patria differt.

Herba perennis. *Rami* prostrati, graciles, radicantes, tetragoni, glabri vel prope basin pubescentes. *Folia* opposita, petiolata, supra sparse pubescentia, subtus glabra; petioli 2–8 mm. longi, graciles; lamina 0·8–2·5 cm. longa, 0·4–1·5 cm. lata, ovata, acuta vel acuminata, basi rotundata vel latissime cuneata, crenata vel serrato-crenata; stipulae ovatae, mucronato-acutae, membranaceae. *Involucra* in singulis axillis 1 vel 2 feminea, tubuloso-urceolata et 1 bisexuale, campanulatum, apice breviter dentatum, omnia extra glabra, intra lanata. *Flores* masculi in involucro bisexuali 6–8, uniseriati, cum flore femineo unico solitarii; perianthio apice acuto, dorso pilis minutis uncinatis sparse pubescente. *Achaenia* compresso-ovata, acute unicarinata, glabra.

South Africa. Swellendam Div.: in the forest at Grootvaders Bosch, *Burchell*, 7232; in woods, without precise locality, *Thunberg*.

As no other than the above collectors seem to have found this plant, and as Thunberg went to Grootvaders Bosch, he probably collected it there. His specimens are absolutely identical in every way with those of Burchell.

Thunberg, when writing the names on the sheets containing his specimens of *Urtica capensis* and *U. caffra*, appears to have done so without a very close examination of them, and has therefore produced some confusion. These two species are represented in his Herbarium by five specimens, mounted on separate sheets, which I enumerate below, giving the modern name of the plants with which I find them to be identical:—

"Urtica capensis α" = *Droguetia Thunbergii*, N. E. Br.
"Urtica capensis α" = *Australina capensis*, Wedd.
"Urtica capensis β" = *Australina capensis*, Wedd.
"Urtica caffra α" = *Droguetia Thunbergii*, N. E. Br.
"Urtica caffra β" = *Australina acuminata*, Wedd.

It will be noted that two sheets of *U. capensis* are marked as "*a*" sheets, but upon a careful comparison of the specimens with Thunberg's description it is quite clear that neither of the "*a*" sheets of *U. capensis* nor the "*a*" sheet of *U. caffra* can be taken

as the types of those species, for it at once becomes perfectly obvious from the characteristics of habit and branching that his description of *U. capensis* so perfectly coincides with the specimen marked "*Urtica capensis* β," and with no other, that it was certainly made from that specimen, and that neither of the sheets marked "*a*" were taken into account at all. Therefore the specimen marked "*Urtica capensis* β" must be taken as the type of that species.

Likewise with *Urtica caffra*, only the specimen marked "*Urtica caffra* β" agrees with his description of that species, and it does so most accurately, especially as to the particulars he gives relating to the stem and branches, and must therefore be accepted as the type of *Urtica caffra*, Thunb., whilst the specimen on sheet "*a*," by its prostrate rooting stems and opposite leaves, is so distinctly opposed to Thunberg's description of *U. caffra*, that he cannot have used it for that description.

The bisexual involucres of *Droguetia Thunbergii* on dissection are puzzling, owing to the manner in which the perianths of the male flowers seem to cling to the inner side of the involucre; they do not seem to be adnate to it, but appear to be held there by the wool, and it is difficult to separate them. When one had been freed, the mystery was explained by finding that the outside of the perianth of the male flowers was beset with minute hooked hairs, which are entangled in the wool on the inside of the perianth and so prevent separation.

IX.—ECONOMIC NOTES: LIVERPOOL.

J. M. Hillier.

The following notes on Vegetable Economic Products were compiled during a recent visit made for the purpose of investigating certain products of irregular import into this country. Previous records on the same subject have appeared in *Kew Bulletin*, 1907, p. 61, and 1908, p. 183.

Timbers.—In the docks large quantities of timber were to be seen, including the following:—

From West African ports mahogany of various dimensions, both in the round with or without the bark on, and in squared logs. Much of this timber is transhipped to the United States of America. Of particular interest was a parcel of African oak (*Lophira alata*) from the Cameroons. Mr. James A. Weale, a well-known local timber merchant, kindly furnished me with the following particulars of this timber. "Owing to its great weight and the difficulties of shipment obtaining on the African Coast, this timber although well known in certain circles has not up to the present found the demand which its virtues deserve. Only isolated logs have come to this market and these from the Gold Coast where it is known as 'Karkoo.' It is there the favourite wood for railway sleepers and heavy constructional work generally. It is now being imported from Duala in the Cameroons, and the first shipments just to hand mark an epoch in the West African trade. This is the first import that

is in sympathy with the wishes of the consumer here. The logs are well sawn on four sides, of sizes from 16 ins. to 28 ins. square and 12 to 25 feet long. The quality may be described as excellent, and such logs in any kind of timber are very seldom seen. We understand it is proposed to introduce this wood for street paving for which purpose it would probably prove very satisfactory. Its structure, hardness and undoubted durability place Lophira wood in the front rank and enable it to compete with other timbers suitable for the purpose mentioned." It may here be noted that African oak or teak (*Oldfieldia africana*), formerly imported into this country from Sierra Leone for shipbuilding purposes, is practically unknown in commerce at the present day.

Some logs of Gaboon mahogany or Okoumé (*Boswellia Klaineana*) were also observed. This timber is employed in France in turnery, carpentry, for cabinet work and marquetry. The natives of the Gaboon form their large canoes or dug-outs from the trunk of this tree. "Brococo" or Sapeli wood from the Benin district was also observed. This timber has a fragrant odour and is one of the African mahoganies. It is believed to be furnished by a species of *Entandrophragma*.

From Usambara, German East Africa, an unfamiliar timber was noted. This I found upon enquiry is known as East African cedar (*Juniperus procera*) and is apparently the wood referred to under the heading of "Substitute woods for Pencils" in the "Timber News," November 1912, p. 4. "Recently they have discovered in German East Africa a species of cedar which, while not as perfect in its essential requirements as the red cedar (*Juniperus*), nevertheless fulfils them in a high degree. It has a fine, straight, and almost even grain; it is just as brittle and nearly as soft as the red cedar; it has a beautiful dark-red colour; is of an even texture and should polish well; is non-resinous, of a light weight and has the pronounced cedar odour. It is reported that there are large quantities of this wood available and that the foreign manufacturers are at the present time using considerable quantities of it." During 1910, 31,000 logs of East African cedar from West Usambara were landed in Germany.

Amongst other unfamiliar woods noted may be mentioned some planks of "Eng" from Rangoon. This is the wood of *Dipterocarpus tuberculatus* described by Gamble in "A Manual of Indian Timbers" as a large deciduous forest tree of Burma. The wood is dark red-brown and hard and is probably the best of the woods yielded by species of *Dipterocarpus*, and is in considerable demand and use for building and boats. Were it not that Burma has so many valuable timbers and especially teak (*Tectona grandis*), Eng would probably be in even greater demand.

In the Canadian and American dock sheds and on the quays a large variety of timbers may generally be found. Many of the following were to be seen in considerable qualities:—Oak, elm and pitch pine planks and boards from New Orleans. Various dimensions of black walnut, poplar, maple, gum, whitewood, birch, satin walnut, hazel pine, cottonwood, pine deals and other familiar woods of regular import. In the same dock sheds were noted from the Tropics, lignum vitae, lancewood spars, ebony, partridge wood from Maracaibo; the

latter is very subject to heartshake. Degami spars (*Calycophyllum candidissimum*) from the West Indies ; this wood is elastic, breaks with a long fracture, is very similar to lancewood with which it is frequently confused, and is valued for golf sticks, fishing rods, &c. Other timbers that could not be readily recognised were also to be seen. On one of the quays were some fine spars of Oregon pine (*Pseudotsuga Douglasii*) from British Columbia, some being shaped 7-sided whilst others still had the bark on. This is a valuable timber for structural purposes, being employed in shipbuilding, for bridge work and in the construction of wharves. Some 10-ft. logs of persimmon (*Diospyros virginiana*) with the bark on from Savannah were also noted. The wood is of a dark brown colour and is valued for weaving shuttles, turnery, golf sticks, shoe-lasts, &c. St. John's pine in the round and squared ; Quebec birch in short logs and some irregularly shaped lengths of St. John's birch, the latter being roughly squared and so imported for chair-making.

There was much converted or partially converted timber to be seen during the time of my visit, the following being especially noted :—Cases of match-blocks of *Pinus Strobus* from Boston ; crates of spade and shovel-handles of ash and large numbers of maple shoe-lasts in the rough from Canada, 12 to 20 ft. lengths of 5 by 5 ins. squares of Columbian pine (*Pseudotsuga Douglasii*) known as "roller squares" used for making cotton-mill rollers ; bundles of hickory (*Carya* sp.) for making golf sticks ; oak staves for casks from New Orleans ; short lengths of birch 2 ft. by 2½ ins. for making bobbins ; maple and birch prepared for flooring ; oak and maple strips for kegs ; also many maple rollers shaped octagonally and tarred on the ends to prevent splitting.

Several of the timber yards were visited, including that of Messrs. Joseph Gardner & Sons. Quoting from the "Timber News" of November 16th, 1912, this firm is referred to in the following words. "The concern occupies a premier position insomuch as they are specialists in almost all kinds of hardwoods, and hold stocks of many timbers with which the trade in general is hardly acquainted. They draw for their supplies on practically every country in the world." Many interesting timbers were noted in this yard including the following :—Persimmon (*Diospyros virginiana*), Knysna boxwood (*Gonioma Kamassi*), wood hard and close-grained used principally for tool-handles, in turnery for yoke skeys and for weaving shuttles, West Indian boxwood (*Tecoma* sp.), likewise used for shuttles, Persian boxwood (*Buxus sempervirens*). Until the previous year no direct shipments of this wood had been made for 20 years ; Turkish walnut (*Juglans regia*) used for gun-stocks, cabinet work, &c. Hassagay wood (*Curtisia faginea*), a tough, strong and elastic wood from South Africa, valued for wheel-work, tool-handles and weaving shuttles. Two varieties of ebony known as Macassar and Madagascar, believed to be furnished by species of *Diospyros* ; Mountain satin wood (*Fagara flava?*) from Jamaica, used for veneering, panels, cabinet-work and for furniture ; Tabascan (*Excoecaria* sp.?) from San Domingo, shipped as Cocus wood ; Cocus wood from Jamaica and Cuba (*Brya Ebenus*); Turkish stone or dogwood in spars, used for shuttles, &c. Squared logs of

Java teak (*Tectona grandis*) of various dimensions ; African Blackwood (*Dalbergia melanoxylon*), shipped as Granadillo, a name also applied by shippers to the Cocus woods above mentioned ; Bahama lignum vitae, manufactured and sold as boxwood in this country ; Partridge wood (*Andira* sp.), known also as ebony to shippers ; Hickory picking-sticks (*Carya* sp.) for weaving looms ; Bahia rosewood (*Dalbergia* sp. ?) in logs of 12 ft. by 1 ft. to 2 ft. ; lignum vitae (*Guaiacum officinale*). This timber has of late often taken the place of brass in engineering, and for stern tubes in shipbuilding. Messrs. Gardner usually have from 600 to 700 tons of lignum vitae in stock ; Hackia wood (*Ixora ferrea*) from Demerara, used for fishing-rods, bows and arrows ; Majagua or Blue Mahoe (*Hibiscus elatus*) in the round from Cuba where it is used for furniture making. In this country it is valued on account of its elasticity for fishing rods. Some logs of Java rosewood and Madagascar redwood were also noted, also a considerable number of ash oars, including a consignment waiting indefinitely for shipment to Galatz.

Oil-seeds and Oils.—Several steamers from the West Coast of Africa were unloading considerable quantities of oil palm kernels and palm oil, and in this connection may be mentioned a hand winnowing machine in use in the dock sheds capable of cleansing from debris 120 bags of palm kernels per hour. Cotton seed in bags was noted from Callao, Peru ; Savanilla, Colombia, and from the West Coast of Africa. Beni seed (*Sesamum indicum*) in bags, shea nuts (*Butyrospermum Parkii*), and seeds of *Pentadesma butyracea* also in bags were observed from the West Coast of Africa, together with bags of undecorticated and decorticated ground nuts (*Arachis hypogaea*) ; copra, the dried kernel of the coco nut (*Cocos nucifera*), was observed from Cape Lopez, also a number of casks of wood oil from the Warri District of West Africa. The latter is probably derived from *Paradaniellia Oliveri* (see *Kew Bulletin*, Add. Ser. IX, part II., p. 270). Bags of linseed (*Linum usitatissimum*) were to be seen from Canada and from the River Plate, the latter weighing on an average about 137 lbs. Kapok seed (*Eriodendron anfractuosum*) in bags was noted from Java and so-called kapok seed from Guayaquil, the latter being probably derived from a species of the nearly allied genus *Bombax*. According to Diplomatic and Consular Report No. 4670, 12,000 tons of kapok seed were exported from Java in 1909 and 10,000 tons in 1910, Liverpool being the principal market for this seed. Some strongly bound casks of Chinese wood oil derived from the seeds of *Aleurites Fordii* were being overhauled in one of the dock sheds and strengthened preparatory to being transported to New York. In connection with the oil-crushing industry in Liverpool it may be mentioned that one firm alone crushes 2000 tons of oil seeds per week.

Fruits, &c.—In the African sheds large quantities of bananas in crates were being unloaded from Elder-Dempster steamers. These were from the Canary Islands, which exported during the year 1911, 2,648,378 crates, Great Britain taking 1,461,866 crates.

From Canada and the United States of America thousands of barrels of apples could be observed, also barrels of grapes from Almeria and Valencia. Lemons in crates and pomegranates in cases from

Malaga, and quinces in cases from Lisbon. Of dried fruits a large import of currants in casks and boxes from Greece was being handled, each package being carefully scrutinized and repaired at the time where necessary. There were also considerable quantities of sultanas in boxes from Smyrna, and raisins in boxes from Valencia. Almonds in bags and boxes from Spain, and many bags weighing 1½ cwts. of nuts from Barcelona were also observed; also boxes containing preserved pine-apple from Singapore in 1 lb. chunks, and boxes of tomatos from Teneriffe.

Miscellaneous Products.—In the West African sheds the following products were noted:—Rubber, known in the trade as "Thimbles," in plaited pillow-shaped packages from Máladi; gum copal from Sierra Leone and Sekondi; gum arabic in boxes of 1 cwt. 3 qrs., bearing the mark of the Royal Niger Company; barrels of bitter kola (*Garcinia Kola*); cases of true kola (*Cola acuminata*); bags of rubber from Forcados; Guinea grains, the seeds of *Amomum Melegueta*, in bags of about 1¼ cwts.; capsicums in bags; bundles of a jute-like fibre from Burutu, probably derived from *Hibiscus lunariifolius*.

In the same sheds were considerable quantities of peeled osiers shipped from Madeira. These were in bundles of two sizes averaging 2 qrs. 15 lbs. and 1 qr. 26 lbs. respectively. The following account of this industry is gathered from Diplomatic and Consular Report No. 4069 on the Trade and Commerce of Madeira for the year 1907.—"Wickerwork.—This industry was introduced 40 or 50 years ago, and the peasantry being most adaptable to this kind of work, it increased year by year. I consider that more attention might be paid on the part of buyers to this excellent work. There are roughly speaking about 700 hands, men and women, employed, and the average amount paid in wages is stated to be from £8000 to £9000 per annum. Less than half of the willows cultivated in Madeira are used for the local industry, the rest being exported to Brazil, Cape of Good Hope and Canaries, and chiefly to the United Kingdom; but the made-up articles—chairs, &c.—are also sent to these countries and some to the United States of America. During 1907 about 400 tons of willows were exported to all countries. The value of one ton of willows is about £11, and the two kinds mostly grown are known as *Salix fragilis* and *Salix vitellina*." Other products noted were Piassaba (*Raphia vinifera*) from several West African ports. This on being landed was weighed into bundles of 5, averaging from 2 cwt. to 2 cwt. 2 qrs.; maize in bags from Lagos; cotton in bags weighing about ¾ cwt. Other products noted elsewhere in the docks were: Manila hemp (*Musa textilis*) packed in matting and securely bound with rattan, weighing on an average about 268 lbs; loofahs (*Luffa aegyptiaca*) in neatly packed bales from Japan; jute (*Corchorus capsularis*) in bales from Calcutta, also large quantities of gunny bags made from this fibre for transhipment to Cienfuegos and Havana; esparto (*Stipa tenacissima*) from Spain; barley (*Hordeum vulgare*) from the Black Sea and Praha Prag; wheat (*Triticum sativum*) from United States of America, Australia, and River Plate; oats (*Avena sativa*) from the Argentine. These were being weighed into bags of 180 lbs.; maize (*Zea Mays*) from the Mediterranean; Patna rice in bags for

transhipment to Havana; unrefined beet sugar in bags from Hamburg; field beans (*Vicia Faba*) from Hankow; tapioca in bags from Singapore; molastella in bags from Java. This product I found upon enquiry to be tapioca root mixed with molasses and employed in the preparation of cattle food, as a good substitute for locust beans (*Ceratonia siliqua*) for the purpose; crushed tapioca root from Java. This had much the appearance of half-stuff for paper-making, being perfectly white. Like the last mentioned this is used for cattle food; rattans of various diameters bent in the middle and tied into bundles of many sizes; onions in crates from Valencia and Lisbon. Immense quantities of cotton were being landed from the United States of America, and one could not fail to observe the great waste of a valuable product due entirely to the flimsy covering of the bales and the absence of a strong binding material.

The following were observed on sale in the city:—Tonquin beans, the fragrant seeds of *Dipteryx odorata*, at seven for sixpence; sweet potatoes, the tubers of *Ipomoea Batatas* at sixpence per lb., and maté or Paraguay tea, the coarsely ground leaves of *Ilex paraguensis* at one shilling and sixpence per lb.

X.—KRASCHENINNIKOWIA.

H. Takeda.

This small genus of *Caryophyllaceae*, established by Turczaninow* and extended by Maximowicz,† though included in *Stellaria* by several botanists‡, is a distinct genus well characterised by the presence of a tuberous rhizome, dimorphic flowers, and 2–4 styles with capitate stigmas. The character of the petals, which are entire in the majority of the species and only emarginate in a very few, points to an affinity with *Arenaria*. Other characters, however, clearly separate it from the latter genus. The species referable to this genus are all small perennial shade-loving herbs occurring in India, China, Corea, Siberia and Japan.

Although *Kraschenninnikowia* has been dealt with by Maximowicz‖ and more recently by Korshinsky¶, a review based on good material seems to be desirable. §So far the following ten species of this genus have been published:—

K. rupestris, Turcz. in Flora 1834, Beibl. p. 9 (nom. nud.); Fl. Baic.-Dah. i, p. 239.

K. heterophylla, Miq., Prol. Fl. Japon, p. 351.

K. raphanorhiza (Hemsl.), Korsh. in Bull. Acad. Imp. Sc. St. Pétersb., sér. 5, ix, 1898, p. 39.

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*Turcz. in Flora, 1834, Beibl., p. 9 (nom. nud.); Fl. Baic.-Dah. i. p. 238, in Endl. Gen. Pl., p. 968.

†Maxim., Prim. Fl. Amur., p. 57.

‡Benth. et Hook. f., Gen. Pl. i, p. 149; Baill., Hist. Pl. ix, p. 113; Hook. f., Fl. Brit. Ind. i, p. 231: Hemsl., Ind. Fl. Sin. i, p. 69; Franch., Pl. Delav. i, p. 100; Pax in Engl. u. Pr., Pflanzenfam. iii., 1, B., p. 80.

§Maxim., Fl Tangut. i, p. 85.

‖Maxim. in Bull. Acad. Imp. Sc. St. Pétersb. xviii, 1873, pp. 374–377.

¶Korsh., ibid. sér. 5, ix, 1898, pp. 37–40.

K. Davidi, Franch., Pl. David. i, p. 51, tab. 10.
K. sylvatica, Maxim., Prim. Fl. Amur., p. 57.
K. heterantha Maxim. in Bull. Acad. Imp. Sc. St. Pétersb. xviii, 1873, p. 376.
K. Maximowicziana, Fr. et Sav., Enum. Pl. Japan. ii, p. 297.
K. himalaica, Korsh., l.c., p. 40.
K. japonica, Korsh., l.c.
K. eritrichioides, Diels in Engl. Bot. Jahrb. xxxvi, Beibl. no. 82, p. 37.

As the result of my investigation, these should be reduced to six species, whilst a new one is to be added. The reasons for the reductions will be found under the species concerned.

The important distinguishing points, which have been used by many workers, are the nature of the leaf and petal, and the number of the styles. The last character appears to be subject to variation, as Maximowicz* and Korshinsky† have noticed, and hardly any stress can be laid upon it, although it has been used by some botanists.‡ Markings on the seed seem to afford a good distinction between certain species, yet mature seeds are not always available in herbarium specimens. In my opinion the form of the petal and shape of the tuber are constant, and therefore reliable.

The leaves also show distinctive characters, yet one should be very careful as to the age of the leaf. When the plant is very young, the uppermost leaves of a heterophyllous species may differ very little from the smaller leaves situated in the lower part of the stem, yet they will in all probability grow much broader later on in the year, whilst the lower leaves have already attained their full size.

Herbarium specimens representing only this early stage would not, of course, show that and would in so far be deceptive. To give an example, *K. raphanorhiza* (Hemsl.) Korsh. represents nothing but a young stage of *K. heterophylla* Miq. (1867), which was described from specimens showing the fullgrown stage of the species. This identification might appear questionable from the description given by Maximowicz, according to which *K. heterophylla* has 4–merous flowers, yet it would appear that this author has examined the cleistogamous flower only, the chasmogamous flower being normally 5–merous.

Enumeratio specierum.

1. **K. sylvatica**, *Maxim.*, Prim. Fl. Amur., p. 57; in Bull. Acad. Imp. Sc. St. Pétersb. xviii, p. 376; in Acta Hort. Petrop. xi, p. 70; Korsh. in Bull. Acad. Imp. Sc. St. Pétersb. sér. 5, ix, p. 40.
Stellaria sylvatica, Rgl., Pl. Radd. i, p. 421, tab. ix, figs. 12–16.
MANCHURIA: Amur, Bureja and Ussuri regions, Kirin. CHINA: Shingking, Kansu. JAPAN: Yesso; Kushiro, Tokachi. COREA.
A very distinct species in having linear leaves, tall slender erect stem, and small napiform tuber.

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*Fl. Tangut. i, p. 85; Pl. Chin. in Acta Hort. Petrop. xi., p. 70.
†Bull. Acad. Imp. Sc. St. Pétersb., sér. 5, ix, 1898, p. 39.
‡Maxim. 11. cc.; Fr. et Sav., Enum. Pl. Japon. ii, p. 297; Franch., Pl. Delav. i p. 101.

2. **K. heterophylla**, *Miq.*, Prol. Fl. Japon., p. 351 ; Maxim. in Bull. Acad. Imp. Sc. St. Pétersb. xviii, p. 377 ; Fr. et Sav. Enum. Pl. Japon. ii, p. 298.

Stellaria heterophylla, Hemsl., Ind. Fl. Sin. i, p. 68 ; Nakai, Fl. Koreana, i, p. 87.

S. rhaphanorrhiza, Hemsl., l.c., p. 69 ; Nakai, l.c.

K. raphanorhiza, Korsh., l.c., p. 39.

K. japonica, Korsh., l.c., p. 40.

MANCHURIA : Ussuri region, Kirin. CHINA : Shingking, Kiangsi, Chekiang. JAPAN : Hondo ; Nikkô, Nambu, vicinity of Tôkyô. COREAN PENINSULA and ARCHIPELAGO.

The identity of *K. heterophylla* and *K. raphanorhiza* has already been mentioned. *K. japonica*, Korsh. is another synonym given to this species. At the first glance the type specimen of *K. japonica* appears to be distinct in the distant arrangement of the thinly pubescent leaves, because in *K. heterophylla* the uppermost two tiers of leaves are generally very much approximate, so that a whorl of four leaves is formed at the apex of the stem. This character, however, is not quite constant, and particularly in the specimens growing in very shady localities the leaves are distantly disposed. The peduncle of this species usually does not exceed the leaf.

This species produces abundantly cleistogamous flowers particularly when growing in shady spots. They may often extend up to the apex of the stem.

3. **K. Davidi**, *Franch.*, Pl. David. i, p. 51, tab. x, excl. var. *stellarioides* ; Korsh., l.c., p. 39.

K. Davidi var. *flagellaris*, Franch., l.c.

Stellaria Davidi, Hemsl., l.c., p. 67.

CHINA : Chihli.

Franchet included two different species under *K. Davidi*, his var. *stellarioides* being identical with *K. Maximowicziana* Fr. et Sav. The procumbent habit of this species is quite peculiar in this genus.

4. **K. rupestris**, *Turcz.*, Fl. Baic.-Dah. i, p. 239 ; Fenzl, in Ledeb. Fl. Ross. i, p. 373 ; Rgl. Pl. Radd. i, p. 379, Maxim., l.c., p. 375 ; Korsh., l.c., p. 39.

SIBERIA : Dahuria. MANCHURIA : Bureja region.

This species has erroneously been regarded by Edgeworth and Hook. f.* to be the same as *Stellaria bulbosa*, Wulf. The Himalayan plant, however, belongs to *K. Maximowicziana* as already pointed out by Franchet† and Maximowicz. ‡

5. **K. Maximowicziana**, *Fr. et Sav.*, Enum. Pl. Japon. ii, p. 297 ; Maxim. Fl. Tangut. i, p. 85 and in Acta Hort. Petrop. xi, p. 70 ; Korsh., l.c., p. 40.

K. Davidi var. *stellarioides*, Franch., Pl. David. i, p. 51, tab. x, fig. i.

Stellaria Davidi var. *himalaica* et *sessilifolia*, Franch., Pl. Delav. i, p. 100.

K. himalaica, Korsh., l.c.

Stellaria bulbosa, Edgew. et Hook. f. in Hook. f. Fl. Brit. Ind. i, p. 231, nec Wulf.

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*Hook. f., Fl. Brit. Ind. i, p. 231

†Franch., Pl. Delav. i. p. 51.

‡Maxim., Fl. Tangut. i. p. 85.

K. rupestris, Maxim. in Bull. Acad. Imp. Sc. St. Pétersb. xviii, p. 376, quoad pl. Japon., fide ipsius.

K. eritrichioides, Diels in Engl. Bot. Jahrb. xxxvi, Beibl. no. 82, p. 37.

HIMALAYA: From the Indus to Bhotan. CHINA: Yunnan; Chihli, Shingking, Kansu. MANCHURIA: Ussuri region. JAPAN: Hondo; Fuji, Hakone.

Franchet described three varieties probably based on different stages or different morphological forms of one and the same species. He is also wrong in referring these to *K. Davidi*. Although I have not seen an authentic specimen of *K. eritrichioides*, I do not hesitate to reduce this plant to *K. Maximowicziana*, for all the essential characters given by the author for the former agree with those of the latter.

6. **K. heterantha**, *Maxim.* in Bull. Acad. Imp. Sc. St. Pétersb. xviii, p. 376; in Acta Hort. Petrop. xi, p. 71, in adnot.; Fr. et Sav., l.c., p. 297; Korsh., l.c., p. 40.

Arenaria vulcanorum, Maxim., in Fr. et Sav. l.c. i, p. 59, nom. nud.

K. rupestris, Maxim., in Fl. As. Or. Fragm., p. 6, non Turcz.

Stellaria rupestris, Hemsl., Ind. Fl. Sin. i, p. 69, nec *K. rupestris*, Turcz.

CHINA: Chihli. TIBET. JAPAN: Kyûshû. Hondo; Nikkô, Tsukuba, Chichibu.

Well characterised by its long pedicels and oblanceolate petals. Hemsley's combination, *Stellaria rupestris*, based on Maximowicz's erroneous record of *K. rupestris* in Fl. Asiae Orient. Fragment., must not be regarded as synonymous with *K. rupestris*, Turcz.

7. **K. Palibiniana**, *Takeda*, sp. nov., speciei praecedenti affinis, sed tuberis fasciculatis nec solitariis, angustissimis, pedunculis brevioribus sepalisque glabris distinguitur.

Rhizoma fasciculatum, fibrosum, fibrillis ad basim angustissime fusiformibus. *Caulis* solitarius vel subcaespitosus, simplex, erectus, glaber, lineis duabus pilis crispulis notatus. *Folia* heteromorpha, omnia fere glabra, inferiora oblanceolata, in petiolum anguste alatum ciliolatum attenuata, acutissima, media anguste oblanceolata, longe attenuata, suprema lanceolato-ovata vel ovata, basi subcuneata, acutissima. *Flores* chasmogami pauci, ad summum caulem orti, pedunculis glabris folia aequantibus vel iis usque sesquilongioribus; flores cleistogami axillares. *Sepala* subulata, ad 6 mm. longa, glabra, margine hyalina. *Petala* oblanceolata, acuta, quam sepala sesquilongiora. *Stamina* 10. *Styli* plerumque 3, stamina paulo superantes. *Semina* matura nobis ignota.—*K. raphanorhiza*, Palib., Consp. Fl. Cor. i, p. 42, nec *Stellaria rhaphanorhiza*, Hemsl., Ind. Fl. Sin. i, p. 69.

COREA: near Seoul, *Sontag*. JAPAN: Hondo; Nikkô, *Bisset*, *Takeda*.

Hemsley as well as Palibin referred specimens collected by Sontag to *Stellaria rhaphanorrhiza*; but whilst Hemsley's represent *K. heterophylla*, those of Palibin form the basis of the species here described. This is a remarkable species in having fasciculate rhizomes.

Clavis specierum supra enumeratarum.

1. Petala obovata, emarginata 2
   Petala integra 3
2. Folia omnia homomorphia, lineari-lanceolata. Planta elata, gracilis, tuberibus brevibus napiformibus 1. *K. sylvatica*, Maxim.
   Folia dimorphia, inferiora oblongo-lanceolata basin versus attenuata, superiora lanceolato-ovata vel ovata. Caulis pro genere crassus, tuberibus fusiformibus, crassis 2. *K. heterophylla*, Miq.
3. Petala obovata vel oblongo-obovato, truncata 4
   Petala oblanceolata acuta 6
4. Folia omnia (exceptis nonnullis infimis) ovata, breviter petiolata. Planta pedalis, caule diffuso ramoso procumbente apice tenuissime flagellari ... 3. *K. Davidi*, Franch.
   Folia dimorphia, inferiora et media lanceolata vel oblongo-lanceolata, basin versus attenuata, supra ovata. Planta erecta 5
5. Folia lanceolato-linearia vel lanceolata, acuminata, breviter petiolata. Petala oblongo-cuneata sepala parum excedentia. Semina glochidiata ... 4. *K. rupestris*, Turcz.
   Folia lanceolata vel ovato-lanceolata, longe petiolata. Petala obovata, truncata quam sepala sesqui-longiora. Semina acute tuberculata ...5. *K. Maximowicziana*, Fr. et Sav.
6. Pedunculi folio subduplo longiores, tuberibus solitariis fusiformibus crassis ... ... 6. *K. heterantha*, Maxim.
   Pedunculi foliis aequilongi vel sesquilongiores, tuberibus fasciculatis angustissimis ... 7. *K. Palibiniana*, Takeda.

XI.—MISCELLANEOUS NOTES.

Mr. William Small, M.A., B.Sc. of the University of St. Andrews, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Botanist in the Agricultural Department of Uganda.

Mr. Walter John Dowson, M.A. of the University of Cambridge, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Mycologist in the East Africa Protectorate.

Mr. Louis Frederic Ruse, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, a probationer gardener for service in India.

Mr. C. K. Bancroft, B.A., Mycologist in the Federated Malay States (*K.B.*, 1910, p. 253), has been appointed Assistant Director of the Department of Science and Agriculture and Government Botanist, British Guiana, in succession to Mr. F. A. Stockdale (*K.B.*, 1912, p. 392).

Mr. Stephen Troyte Dunn, B.A., F.L.S., late Superintendent, Botanical and Forestry Department, Hong Kong, has been appointed by the President of the Board of Agriculture and Fisheries, Official Guide to the Royal Botanic Gardens, Kew, for one year from April 1st next.

The appointment of a Guide has been approved by Government as a temporary measure. Full particulars with regard to the tours will be made available at an early date.

Memorial to Sir J. D. Hooker.—A tablet to the memory of the late Sir Joseph Dalton Hooker was unveiled by Lady Hooker in Kew Church on Saturday, the 22nd of February. The ceremony was private and only members of the family and a few friends were present. The tablet, which has been placed on the wall of the north aisle near that of Sir W. J. Hooker, is a slab of polished marble with an inset oval medallion portrait of Sir Joseph and five surrounding panels. The portrait and panels are wedgwood, the ground work being a pale green. The portrait represents Sir Joseph at the age of eighty. The subjects of the panels are various plants typical of the wide range of his work and interests. The lower side panels contain: *Cinchona Calisaya* (introduction of Cinchona into India); *Rhododendron Thomsonii* (Himalayan Travels and Flora of British India) with *Celmisia vernicosa* (Flora Antarctica) between; in the two upper panels the plants are *Aristolochia Mannii* (African Floras) and *Nepenthes albo-marginata* (pitcher plants and Malayan flora). The following inscription has been engraved in the upper portion of the tablet:—

1817 – 1911.

J O S E P H D A L T O N H O O K E R,
O.M., G.C.S.I., C.B., M.D., D.C.L., L.L.D.
ASSOCIÉ ETRANGER OF THE INSTITUTE OF FRANCE,
KNIGHT OF THE PRUSSIAN ORDER 'POUR LE MÉRITE',
SOMETIME PRESIDENT OF THE ROYAL SOCIETY,
FOR XX YEARS DIRECTOR OF THE
ROYAL BOTANIC GARDENS, KEW.
BORN AT HALESWORTH, 30 JUNE, 1817.
DIED AT WINDLESHAM, 10 DECEMBER, 1911.

THE WORKS OF THE LORD ARE GREAT
SOUGHT OUT OF ALL THEM THAT HAVE PLEASURE THEREIN.

Below have been placed the arms and motto of the family with, in addition, the motto of the Most Exalted Order of the Star of India.

The memorial tablet is the work of Mr. Frank Bowcher, the artist who prepared the medallion referred to in *K.B.* 1899, p. 53.

Botanical Magazine for February.—The plants figured are *Coelogyne cristata*, Lindl. (t. 8477); *Rhododendron sublanceolatum*, Miquel (t. 8478); *Cytisus nigricans*, Linn. (t. 8479); *Heliotropium anchusaefolium*, Poir. (t. 8480); and *Agave Haynaldii*, Tod. (t. 8481).

Coelogyne cristata, certainly one of the most beautiful orchids, a favourite because of its comparatively easy culture and from the fact that its handsome flowers are produced in the winter, was introduced into cultivation in 1837 and flowered for the first time in the collection of Mr. G. Barker of Springfield, Birmingham, four years later. It is now represented in gardens by at least three fine varieties. A native of the Temperate Himalaya, and most abundant from Central Nepal eastward to Bhutan, it is found as far west as Kumaon, and extends to the Jaintea and Khasia Hills in the east.

The *Rhododendron* is a native of the Loo-Choo Islands and is nearly allied to the well-known *R. indicum*, Sweet, being regarded by some authorities as a variety of that species. It may, however, be easily separated from *R. indicum* by the much larger ciliate calyx-lobes, and by the larger corolla. This is bright red, spotted with a darker colour on the upper lobes, and is over two inches long. The figure was prepared from material taken from a plant growing in the nursery of Mr. R. C. Notcutt, at Woodbridge.

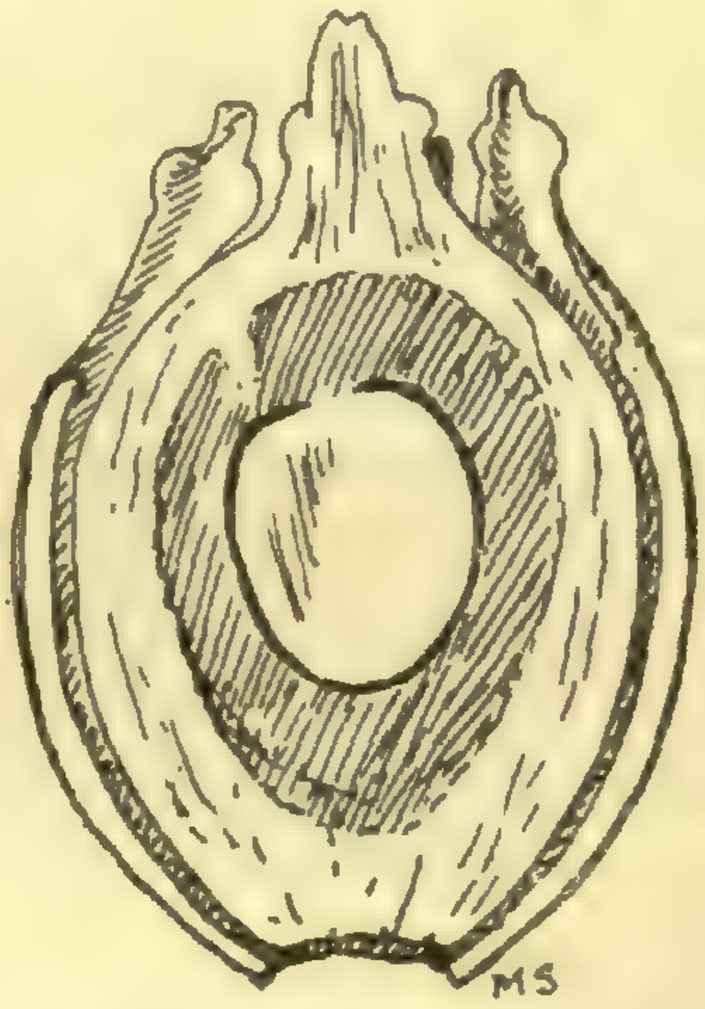
Cytisus nigricans was one of the earliest species brought into cultivation in England, its introduction dating back to 1730. A native of Europe, it is very widely distributed, occurring in Switzerland, North Italy, and in practically all the countries of South-central Europe to South Russia.

The *Heliotropium* is a perennial herb, native of Eastern Brazil, Uruguay and the Argentine Republic, and while closely resembling in its flowers the familiar Sweet-scented Heliotrope (*H. peruvianum*, Linn.) it lacks the fragrance characteristic of the latter. It has been in cultivation for many years and flowers freely at Kew, where it is necessary to protect it during the winter. The illustration was prepared from material supplied from Miss Willmott's garden at Warley Place.

Agave Haynaldii is a member of the Marginatae group of Littaeas, distinguished by the horny border of the leaves and by the short perianth-tube with lobes which embrace the stamens as soon as the anthers are ripe. It is a Mexican or Central American species, and the plant from which the specimen figured was obtained is one that Dr. H. Ross, of the Palermo Botanic Garden, sent to the garden of the late Sir Thomas Hanbury at La Mortola in 1897. The inflorescence, produced in 1910, was 23 ft. long, borne on a peduncle 4½ ft. long.

Oil Palm with Fleshy Perianth.—A specimen of a form of *Elaeis guineensis*, Jacq., has been received at Kew from Mr. W. H. Johnson, Director of Agriculture, Southern Nigeria, which had been found near Calabar, and is said to be called by the Eifik people "Ayara Mbana." The distinguishing character of this form is the presence around the fruit of a "collar," which consists of the persistent perianth having become more accrescent and more fleshy

than usual. Very little notice appears to have been taken previously of the perianth at the time when the fruit is mature, probably owing to it having been removed before the fruit is brought into the market. Chevalier (*Les Végétaux Utiles*, fasc. viii. p. 41) refers to it thus :—"A complete maturité, ils [the fruits] sont sessiles et renfermés commes dans une cupule dans le périanthe un peu accru mais scarieux et desséché depuis longtemps."



In Mr. Johnson's specimen the fruit is obovoid or subglobose, about 3 cm. long (not including the 1 cm.-long beak) and somewhat constricted at the base, not ventricose as in some varieties. The sclerenchymatous endocarp is about 3 mm. thick. The 6-partite perianth is accrescent, fleshy and almost encloses the fruit. Its segments have a transverse thickening about 5 mm. from their apices. According to an analysis made at the Imperial Institute it contains "69·9 per cent. of oil, equivalent to 14·8 per cent. calculated on the whole fruit, or 78·2 per cent. calculated on the dry pulpy covering." The ordinary pulp adhering to the nuts of this form yields 27·2 per cent. of oil. A specimen collected by Sir John Kirk at Zanzibar in 1869 shows the perianth enlarged in a similar manner,

C. H. W.

Kerstingiella geocarpa.—We are much indebted to Mr. P. H. Lamb, Director of Agriculture, Northern Nigeria, who has lost no time since his appointment in obtaining information about this new ground bean and in sending home material. A tin of seed pods reached Kew early in January of this year and with it Mr. Lamb sent the following particulars about the plant :—

"With reference to the article on 'A new Ground Bean' (*Kerstingiella geocarpa*), appearing in the *Kew Bulletin*, No. 5 of 1912 [pp. 209–213, with Plate], I have the honour to inform you that I have despatched to you by this week's mail a tin containing about 4 lbs. of the seed-pods of this interesting plant. These I got from a plot of one-tenth of an acre growing near Bida, the principal town of the Nupe Province. Besides this plot I have only seen one other place where a few plants were growing, and this was in a plot of *Voandzeia subterranea* also near Bida.

"Since my arrival in Nigeria I have toured around Kano, Zaria, Kabba and Ilorin, and have been always on the look out for

Kerstingiella geocarpa, but have only seen it on the two occasions mentioned above. It appears to be very rarely cultivated and not generally known. The cultivator of the plot of one-tenth of an acre informed me that he got the seed from the Kukuruku country in South Kabba two years ago.

"The Nupe name for it is 'Eyeya' or 'Ezokin,' which latter name simply means 'bean of the ground.'

"The Kukuruku name is 'Etami.'

"The Hausa name for *Voandzeia subterranea*, a very general crop in Northern Nigeria, is 'Kawaruru' pronounced by many of the Nupe people 'Paruru.'

"Hausas to whom I showed the growing crop of *Kerstingiella geocarpa* called it, without hesitation, 'Kawaruru,' doubtless owing to its general similarity to that crop, but on showing them the harvested pods they admitted that the crop was quite strange to them and that they had no name for it.

"It would indeed be extraordinary if two such totally different seeds were called 'Kawaruru.'

"The measurement of the seeds given on page 210 [*K. B.*, 1912], where 'cm.' has evidently been written in error for 'mm.,' appears to be considerably in excess of that of the present sample.

"Though most of the pods carry either one or two seeds, some were noticed containing three.

"The crop yielded at the rate of 600 lbs. of dry pods per acre.

"The beans are boiled and eaten in the usual way, no superstition here existing as to their unsuitability for women

"The cultivation is exactly the same as for *Voandzeia subterranea*, sowing took place this year in July and harvesting about 3½ months later in October. The temperatures averaged approximately max. 85° F. and min. 70° F. during this time, and the air was exceedingly moist.

"I have been unable to observe it in the wild state. It is hoped to continue the cultivation of this plant as an experimental plot next season.

"I am also sending by this mail two small samples of the seed of *Voandzeia subterranea* both purchased in Bida. They appeared to me to be interesting as illustrating the great variety both in size and colour which may occur in this species."

The seeds of *Kerstingiella geocarpa* and *Voandzeia subterranea* have been sent to Natal Botanic Garden, Jamaica, Trinidad, Bangalore, Calcutta, British Guiana, Queensland, and Adelaide Botanic Garden.

The Destruction of Albizzia Lebbek in Cairo.—Mr. G. St. C. Feilden, Chief Gardener to the City of Cairo, has, at our request, kindly sent the following note on the mealy bug which has caused such havoc among the Lebbek Trees in the streets of Cairo.

Until the summer of the year 1909 Cairo contained some thousands of fine specimens of *Albizzia Lebbek*, which formed shady avenues

throughout the town. In the space of four years three-quarters of these trees have disappeared, their destruction having been brought about by the ravages of a species of mealy bug, *Dactylopius perniciosus*. Such are the depredations of this pest that in four months it will entirely destroy the largest tree. Although it is only of recent years that this mealy bug has made its presence felt it has doubtless existed in Egypt unnoticed for a number of years.

The insects can be found on almost every Lebbek in the neighbourhood of Cairo but it is only in the town itself that it has caused serious damage. Here the trees planted in paved and tarred streets, deprived of air at the roots except that provided by a small grating, and shut in by high houses on each side, were growing under unnatural conditions and were in consequence in indifferent health. On the Gesirah side of the Nile, where the paths are not paved or the roads tarred, and where the trees are exposed to every wind, the mealy bug, though everywhere present, makes no headway. It would seem therefore that the increase of the insect is influenced by the state of health of the host. The attack begins in May, is at its height in June and July, and commences to slacken in August. The species appears to be very prolific. Mr. F. C. Willcocks, entomologist to the Khedivial Society of Agriculture, found 1100 eggs in the ovisac of a female.

The young larvae settle on the twigs and in the axils of the leaves and the trees then appear to be covered with lumps of dirty white wool. Presently the whole crown of the tree shrivels, presenting a scorched and blackened appearance. The leaves then fall, but many are caught and retained by the sticky secretion of honey dew given off by the insects, and by their slightly adhesive ovisacs. Little bundles of fallen leaves and stamens thus accumulate all over the tree, giving it a bunched appearance. These collections of leaves form a very efficient protection to the insect and render the application of spraying emulsions almost useless. In August the tree is completely defoliated and in a few months it dies. As above mentioned, spraying unless carried out at an early stage, is of little avail, and furthermore the height of the trees renders the operations very difficult of thorough performance. A drastic remedy tried was that of cutting back the trees attacked almost to the main trunk and cleansing with a strong petroleum emulsion applied with a stiff brush.

The trees so treated, however, nearly always died, or if they survived were permanently spoilt in appearance. There can be no doubt that the Lebbek is doomed as an avenue tree in Cairo, except under the most favourable conditions. The problem that remains is to find the most suitable trees to take its place. The danger of relying on one species only has been sufficiently demonstrated.

An interesting account of the mealy bug, illustrated by some excellent photographs, both of the pest and the infected trees in Cairo, was published by Mr. F. C. Willcocks in the Bulletin of Entomological Research, Vol. I. pp. 121–141 (1910–11).

The Reproduction of Musanga Smithii.—One of the most striking features of tree life on the West Coast of Africa is the rapidity with which abandoned clearings are covered by the Umbrella tree or Corkwood (*Musanga Smithii*, P. Beauv.). This is commented on by all travellers, and it is brought to one's notice more especially by the long stretches of hillside covered with this tree which are to be found along the railway, round mining centres, and in fact wherever any land, which has been stripped of its original forest covering, is left to itself for a few months.

The general appearance of these pure stands of Umbrella tree is that of a young open wood, the trees being all of an even height of about 30 feet. Although there may be many acres of such forest, one never sees amongst them any flowers or signs of flowering trees. For these it is necessary to go into the original uncut "bush," and there occasionally an old tree may be found, much larger than those in the open, generally solitary or with a very few of its own kind, and, if it is flowering, in the majority of cases it is found to bear male flowers only.

This fact suggested that a closer examination of the pure stretches of forest composed of this tree should be made, with a view to ascertain the method by which its area is so effectively and so rapidly extended. The stands examined were those at Amokokrom, and Boundary Post in the Western Province of the Gold Coast Colony.

It was then noticed that the trees towards the outside and exposed parts of the forest put forth adventitious roots from all parts of the stem up to a height of about 10 feet from the ground. Sometimes these roots came away from the stem at a right angle and, after growing out horizontally for about a foot, inclined slightly downwards until they reached the soil. On reaching the soil a shoot was sent up from the end of the root and a new tree was thus formed at some little distance from its parent. In other cases the adventitious roots inclined downwards at once from their point of origin, in this case striking the soil in the immediate vicinity of the parent tree.

Often the roots were noticed to have been broken in mid air, when in some cases they simply forked, the two rootlets continuing downwards to the soil and forming two new trees; or in other cases a shoot was sent up and a root down from the point of injury, thus starting a new tree in mid air. There seems little doubt, therefore, that these pure stands are extended effectually by vegetative reproduction, at least within the zone of the moist Evergreen Forest, and in consequence the formation of flowers and fruit has fallen into disuetude.

T. F. Chipp.

Insecticides, Fungicides and Weedkillers.*—This book is an attempt to summarise what is known up to the present of the chemistry,

* Insecticides, Fungicides and Weedkillers.—A practical manual on the diseases of plants and their remedies, for the use of Manufacturing Chemists, Agriculturists, Arboriculturists, and Horticulturists. Translated from the French of E. Bourcart, D.Sc. 450 pp. 83 tables and 12 illustrations. Scott, Greenwood & Son. 1913. 12*s.* 6*d.* net.

uses and mode of action of the various preparations used in agricultural practice, and contains much useful information which is not given in text-books written from a botanical standpoint.

The detailed descriptions are prefaced by a chapter on general principles, in which the importance of attention to general hygiene and avoidance of conditions predisposing plants to disease is insisted upon.

At the end of the book there is a useful glossary in which short accounts of the various destructive insects and fungi are given. There is also a well-compiled index but unfortunately references to literature are omitted.

Forestry in South Africa.—The Report of the Chief Conservator of Forests, Union of South Africa, for the year ending December 31st, 1911, contains an interesting account of the work of the Department during the year, together with a detailed statement of revenue and expenditure for the same period.

The work of the Department is apparently divided into two branches, the object of the principal branch being to renovate old forests and to create new ones for the supply of timber and other forest products for general use, whilst the energies of the other division are concentrated upon raising timber mainly for the purpose of supplying sleepers for State railways.

The various statistical tables point to steady progress, and in the case of the older plantations to an increasing revenue with a decreasing net working cost. But the allusions to losses caused by insect and fungus pests, fires and theft, indicate that the trials incidental to the formation of new plantations and the renovation of old forests are as prevalent in S. Africa as they are elsewhere, and that it is always wise when estimating for proposed work to allow a generous margin for such contingencies.

It is interesting to observe that in almost all cases greater faith is placed upon exotic than upon native trees for planting, and that where groups of indigenous trees occur they are usually self-sown seedlings. Even for underplanting forests of native trees, exotics are used.

The chief native trees are *Podocarpus* spp., *Ocotea bullata*, *Curtisia faginea*, *Olea laurifolia*, *Apodytes dimidiata*, *Ptaeroxylon utile*, *Gonioma Kamassi*, and *Callitris arborea*, whilst various species of *Eucalyptus* and Australian *Acacia* divide with *Pinus insignis*, *P. Pinaster*, *P. canariensis* and *Cedrela Toona* the honour of being the principal exotic trees grown. Several of the latter species with *Pinus sylvestris* are reproducing themselves in or about the forests.

The highest price obtained for the wood of a native tree was 1*s.* 1*d.* a cubic foot, for the wood of *Ocotea bullata*; the highest priced exotic being *Eucalyptus* at 10¼*d*, a cubic foot. Thinnings from plantations of *Pinus Pinaster* and *P. insignis* realised 6*d.* and 5*d.* a cubic foot respectively. To illustrate the difference in price obtained for the wood in the forest and the same wood in Cape Town worked up ready for use, 2¼*d.* a cubic foot was obtained for yellow

woods (*Podocarpus* spp.), in the forest, whereas the manufacture value in town was never less than 5*s*. a cubic foot.

An idea of the annual increment which is taking place in various plantations may be gathered from the accompanying table :—

Locality.	Species.	Age: Years.	Espacement.	Mean Height.	Mean Girth.	Cubic ft. per Acre.	Mean Annual increment per Acre.	Remarks.
			Ft.	Ft.	In.			
Bazeya (Mountain)	Eucalyptus saligna.	6	5×5	50	11½	2,660	443	
Do.	Acacia decurrens var. mollissima.	11	6×5	43	10½	2,836	258	Excluding thinnings, first of which was made at 6 years of age.
Libode (Coast)	Eucalyptus saligna.	11	5×5	78	24	6,496	590	
Amanzamnyama (Mountain).	Pinus Pinaster.	14	4×4	40	11	5,258	375	
Do.	Pinus insignis.	17	3×6	71	25½	5,537	326	Thinned to 8 ft. × 8 ft. at 11 years. No record quantity thinnings kept.
Cencane (Mountain).	Acacia decurrens var. mollissima.	6	3 ft. drills	27	4½	2,760	460	

During the year 111,205,265 pounds of Wattle (*Acacia*) bark, valued at £289,557, were exported for tanning, Germany taking about two-thirds and England the remainder. It is, however, considered that a better trade with England might be established by exporting extract rather than the bark itself.

Another rather important article of export during the year was Buchu (*Barosma* spp.) leaves. About 212,082 pounds, valued at £29,647 were exported. This is considered to be such an important article that the collection of leaves is placed under the supervision of the forest officers.

The Report concludes with 14 interesting illustrations of forest scenery and forest work.

W. D.

CATASETUM DARWINIANUM.

To face page 99.]

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 3.] [1913.

XII.—CATASETUM DARWINIANUM.

R. A. Rolfe.

The accompanying plate represents a plant of *Catasetum Darwinianum*, Rolfe, bearing male and female flowers on the same inflorescence. The plant flowered last autumn in the Kew collection, with a second plant which bore only male flowers. Both specimens are divisions of a single plant which in 1888 produced both sexes on separate inflorescences, one of about 16 male flowers on one side of the pseudobulb and one of three females on the other side. In the present case the three upper flowers are males, the next female, and the lower one is in a transition state, the lip being most like the female in shape, but the sepals and petals most like the males, while the pollinia are almost normally developed. It may be added that in the female flower the anther case and the pollinia—both of male origin—were suppressed, while the stipes and gland of the pollinarium—which belong to the rostellum, and are therefore female in origin—were developed. The lip of the female, it will be observed, is hood-shaped and uppermost, while the sepals and petals are recurved and rather fleshy in substance, and the column very short and stout, with a slender apiculus. In the males the lip is inferior and consists of an ovate-oblong body, slightly convex and tridentate at the apex, and concave or with a shallow sac at the base. The sepals are lanceolate and spreading, and the somewhat narrower petals are parallel and situated in front of and appressed to the upper sepal, and therefore hardly distinguishable in the photograph. The column is longer than in the female, much more slender, and bears a pair of slender somewhat diverging sensitive antennae, which are totally absent from the female. Another remarkable difference between the sexes is that the female flowers are green, with a few dingy purple markings, while the males have lurid reddish-purple sepals and petals, and the lip is heavily spotted with blackish-brown on a dull green ground.

The phenomena here illustrated were long a profound puzzle to botanists, and plants bearing female flowers only were originally referred to a distinct genus by Lindley, under the name of *Monachanthus*, while the males of certain species, structurally identical

(28996—6a.) Wt. 212—780. 1125. 4/13. D & S.

with the one here figured, were referred by him to *Myanthus*, on account of the difference in their structure from the original *Catasetum macrocarpum*, Rich. Lindley afterwards pointed out his mistake, when an inflorescence combining two of his supposed genera was sent to him by the Duke of Devonshire (Bot. Reg., t. 1947 A, text 1951*), but without understanding the significance of the phenomenon, and, while remarking that the supposed genera *Myanthus* and *Monachanthus* must be restored to *Catasetum*, he added : "But which of the species have their masks on, and which show their real faces, I certainly will not presume to guess."

The question was the subject of a noteworthy paper by Darwin, published in 1862 (Journ. Linn. Soc., vi. pp. 151–157), entitled "On the Three remarkable Sexual Forms of *Catasetum tridentatum*, an Orchid in the possession of the Linnean Society." In this paper Darwin sought to show that *Catasetum tridentatum*, Hook., produced three different kinds of flowers, which represented male, female and hermaphrodite states of the same species. A wood-cut of each was given.

Darwin established the fact that the sportive character of *Catasetum*, or the curious habit of its species of suddenly producing flowers of a totally different kind (usually termed "monsters") on the same plant was simply an abnormal combination of different sexual forms in the same individual, but he failed to discover that the name *Monachanthus viridis*, Lindl., had been extended so as to include more than one species of *Catasetum*. In fact he misread some remarks of Schomburgk, who had already stated that *Monachanthus* alone bore seeds, and had expressed the opinion that "the genera *Monachanthus*, *Myanthus* and *Catasetum* form but one genus" (Trans. Linn. Soc., xvii. p. 551). The consequence of this was that Darwin, whilst showing satisfactorily that *Catasetum* was male and *Monachanthus* female, thought that *Myanthus barbatus*, Lindl., of which he had only a spirit specimen, might be considered as the hermaphrodite form of the same species. This view passed as current for many years, until, after a re-examination of all the records, aided by some fresh materials, the writer was enabled to clear the matter up in a paper entitled "On the Sexual Forms of *Catasetum*, with special reference to the researches of Darwin and others" (Journ. Linn. Soc., xxvii. pp. 206–225, t. 8).

In this paper it was shown that the females of three different species of *Catasetum* passed under the name *Monachanthus viridis*, Lindl., the original one, apparently the female of *C. cernuum*, Reichb. f. (*Myanthus cernuus*, Lindl.), one figured in the Botanical Register (t. 1752), of which *C. macrocarpum*, Rich. (*C. tridentatum*, Hook.) is the male, and *M. viridis*, Schomb., the male of *C. barbatum*, Lindl. (*Myanthus barbatus*, Lindl.). Thus *Catasetum tridentatum* and *Myanthus barbatus* were both males, very distinct from each other, though a general resemblance of the females to each other had led to all being confused under a single species.

An examination of all the materials available led to the establishment of four distinct sections of the genus, as follows :—

i. **Eucatasetum**, *Rolfe*.—Lip superior in both sexes, generally more or less galeate in the male, always so (as far as known) in the

female. Rostellum in the male prolonged below into a pair of slender cirrhi, called the antennae.

ii. **Myanthus**, *Rolfe* (genus of Lindl.).—Lip inferior in the male, not galeate, more or less expanded, sometimes fringed; superior and galeate in the female. Rostellum in the male prolonged below into a pair of slender cirrhi.

iii. **Ecirrhosae**, *Rolfe*.—Lip inferior in the male, as in *Myanthus*, but more or less saccate. Rostellum not prolonged into cirrhi. Female unknown.

iv. **Pseudocatasetum**, *Rolfe*.—Lip deeply saccate in the male, superior or inferior. Rostellum not prolonged into cirrhi. Female, where known, much larger than the male, with galeate lip.

The mechanism of propulsion of the pollinia by means of the sensitive antennae was fully explained by Darwin, and the method of fertilisation in *C. tridentatum* was afterwards described and illustrated by Criiger (Journ. Linn. Soc. viii. p. 127, t. 9), who was able to observe the species in Trinidad, where it is common. The visiting insect is described as a "large humble-bee, noisy and quarrelsome," which visits the flowers of both sexes for the purpose of gnawing some cellular tissue in the interior of the sac. On visiting the male flowers the pollen masses are thrown on to the back of the insect, and Criiger had often seen them flying about with this peculiar-looking ornament on them. On subsequently visiting the female flower the pollinia were caught by the upper margin of the stigmatic cavity, and were left behind on the retreat of the insect. The function of the sensitive antennae in the sections *Eucatasetum* and *Myanthus* is thus apparent, but these organs are not developed in the more primitive *Ecirrhosae* and *Pseudocatasetum*, so that some other mechanism must be available, which it would be interesting to work out.

Catasetum Darwinianum was described in 1889 (Rolfe in Gard. Chron., 1889, v. p. 394), the plant having flowered at Kew in the previous autumn, and was at first identified with *C. fuliginosum*, Lindl. (Rolfe, l.c. 1887, iv. p. 473), a species which was described by Lindley from a plant of unrecorded origin which produced female flowers only at Syon House, in 1841, and was subsequently lost. The Kew plant was obtained from Messrs. Sander, St. Albans, to whom it had been sent with other Orchids by one of their collectors from Mt. Roraima. It belongs to the section *Myanthus*, and is allied to *C. callosum*, Lindl., but has smaller flowers of darker colour. A painting, natural size, of the plant was made for the Kew collection, and a reduced figure was given in the paper above mentioned (Rolfe in Journ. Linn. Soc., xxvii. p. 218, t. 8), with flowers of both sexes, natural size, and dissections. The species was named in compliment to the great naturalist, but was not one of those investigated by him.

It may be added that the females of some 20 species are now known, representing perhaps a third of the genus, so that there is plenty of scope for those who may be able to observe the plants in their native wilds or who cultivate them at home. It is greatly to be desired that this blank in our knowledge should be filled up.

The female flowers are for some reason much rarer than the males, but are generally borne upon the same plants, and occasionally on the same inflorescence, as in the present case.

XIII.—A NEW BANANA FROM THE TRANSVAAL.

(*Musa Davyae*, Stapf.)

O. Stapf.

On the cover of the April number of the Transvaal Agricultural Journal for the year 1904 a banana of especially fine growth was figured, standing in a garden. No reference was made, on the cover or in the text, to the place where it grew or the species to which it belonged; but from a later communication by Mr. J. Burtt Davy, the Government Agrostologist and Botanist for the Transvaal, it was understood that the figure represented a Musa from the Drakensbergen, Zoutpansberg District, Transvaal, grown in a garden at Pretoria. The same species was referred to by him in the Transvaal Agricultural Journal for 1907 (vol. v. p. 422) as "*Musa Livingstoniana*, Kirk? Wild Banana; Wild Piesang; Matella." It was there said to grow along streams on the eastern slope of the Drakensbergen from 4800 ft. down to about 2800 ft. Subsequently in 1911 in an article on "Banana and Plantain fibre" (Agr. Journ. Union S. Afr. vol. I. p. 93) it was, by the same author, referred to *Musa ventricosa*. In the same year Mr. W. C. Worsdell communicated to Kew seeds of this plantain which he had gathered near the fruit-farm "Westphalia," about 60 miles north of Pietersburg, Zoutpansberg District, in 1911. From the seeds it was evident that the plant belonged neither to *M. Livingstoniana* nor to *M. ventricosa*; but in the absence of specimens no determination was possible. Last year, however, Mr. Burtt Davy sent drawings of the inflorescence, flowers and fruits made from the plant in 1906 by Mrs. Burtt Davy, and these rendered it possible to connect the Transvaal plant with good flowering specimens which were collected in 1907 by Mr. W. H. Johnson in Amatonga's Forest in Portuguese East Africa just over the Transvaal frontier, and almost in the same latitude as the Zoutpansberg District.

It is evident that this Musa comes near to *M. Ensete* and may be still more closely allied to *M. Buchananii* from the Shire Highlands; but the latter is so imperfectly known that adequate comparison is not possible. A technical description of the species together with a differential diagnosis relative to *M. Ensete* is given below.

M. Davyae inhabits as far as is known at present an area lying between 30° 25′ to 32° 30′ E. long. and 23° to 24° S. lat. According to Mr. Burtt Davy it occurs forming groves "in sheltered Kloofs at about 1400 m. altitude, on the eastern slopes of the Houtboschberg, a spur of the Drakenberg Range in the Zoutpansberg Magisterial District." He found plants growing actually in the water of

mountain streams about 10 miles from the village of Harnertsberg, "and it was also reported to him as abundant along the rivers of the Low Veld below Krabbesfontain (800 m)." Mr. Worsdell's collecting place near "Westphalia Farm" has already been mentioned. There is also a leaf of a Musa at Kew which belongs almost certainly to *M. Davyae* and was collected by Mr. H. Mingard in the Spelenken mountains near Elim in 1905. A further locality is indicated by the name of a hill 'Pisang Kop' (400 m.), in the Zoutpansberg range, north of Albasini in 30° 30′ E. Long. and 23° 35′ S. Lat. This name appears already in the Transvaal map published in Petermann's Mittheilungen, Erg. B. v. no 24 (1868), where the hill is, however, placed 17 miles due east of Albasini. As the Boers came first into the district in 1844, the occurrence of the banana or pisang in those mountains must have been known for a long time. All these localities are in the Transvaal. On the other hand, Mr. Johnson's specimen comes from Portuguese territory and an altitude of not quite 400 m. He describes the locality as "Amatonga's forest." This is evidently the forest near Amatonga's kraal to the east of the Limpopo river and in the latitude of Elim. The native name quoted by Mr. Burtt Davy in the Transvaal Agricultural Journal is "Matella," or as spelt in his latest communication "Mawdawla" (Modjadjie natives).

Musa Davyae is said to yield a fibre used by the natives, but as the fruit is not edible it would, in Mr. Burtt Davy's opinion, not pay to cultivate the species unless the fibre should prove to be particularly valuable.

Musa Davyae, *Stapf*, affinis *M. Ensete*, J. F. Gmel., vel potius *M. Buchananii*, Bak., speciei imperfecte notae, sed ab illa bracteis flores subtendentibus magis oblongis, floribus tantum circiter 15 cum unaquaque bractea minoribus, labio interiore (supero) profundius lobato, ab hac bracteis latioribus, labio exteriore angustiore et seminibus haud atris differt.

Planta monocarpica. *Truncus* spurius 10–13 m. altus. *Foliorum* laminae erectae vel oblique erectae, rigidae nisi superne leviter recurvatae, oblongo-lineares vel anguste-oblongae, obtusae, 4–5 m. longae, ad 60 cm. latae, subglaucae, costa supra canaliculata rubra, nervis lateralibus primariis 5–7 mm. vel in foliis majoribus 1 cm. distantibus. *Inflorescentia* integra haud visa ; pedunculus aeneus, glauco-pruinosus, basi ad 5 cm. crassus ; bracteae flores subtendentes oblongae vel ovato-oblongae, obtusae, 27–30 cm. longae, 11–12·5 cm. latae. *Flores* circiter 15 cum unaquaque bractea, albido-lutescentes. *Receptaculum* cylindricum vel anguste clavatum, 2 cm. longum, glauco-pruinosum. *Tepala* externa 3 cm. longa cum duobus internis lateralibus approximatis labium inferum formantia, e basi per 4 mm. connata, deinde per 6–7 mm. soluta, supra iterum fusa ita ut lamina linearis 2–2·5 mm. lata apice 3-dentata crassiuscula constituatur cui tepala interna tenuia 0·4 mm. lata crispo-undulata arcte adhaerent, dentibus 3–4 mm. longis ; tepalum internum superum lobo intermedio e basi latiore subulato 3–5 mm. longo, lobis lateralibus rotundatis vel ovatis et tunc interdum subacutis 2–3 mm. longis, totum 1·2 cm. longum. *Stamina* perfecta 5 ; filamenta ad 1·6 cm. longa ; antherae 1·7–2 cm.

longa ; stamen sixtum (superum) staminoideum filiforme vel nullum. *Stylus* cum stigmate oblique ovato 2·5 cm. longus. *Infructescentia* integra ignota. *Baccae* clavatae, 7·5–12 cm. longae, ad 4 cm. diametro, maturae flavidae. *Semina* pauca, in pulpa parca flavida insipida immersa, depressa, irregulariter orbicularia, vel obtuse triangularia, 1·6–1·8 cm. diametro, hilo excavato subtriangulari magno ; testa laevis, plumbeo-brunnea.

XIV.—FUNGI EXOTICI: XVI.

Three of the new Fungi described have developed on a small piece of cattle dung sent from Singapore by Mr. I. H. Burkill enclosed in a letter. *Pilobolus crystallinus* appeared soon after the dung was placed under suitable conditions and in the course of time the three other fungi, new to science also developed. The three other species have been received from Kuala Lumpur, Queensland and the West Indies.

Basidiomycetes.

Merulius binominatus, *Massee*.

Hymenophorum late incrustans, vegetum contiguum ; hymenium subgelatinoso-molle, superficie plicis sinuosis obtusis reticulatum, hinc inde incomplete porosum, sordide aurantiacum, in sicco fulvescens. *Sporae* subglobosae, flavidae, 4 × 3·5 μ.

Queensland. Brisbane : Botanic Gardens ; on bark of a *Callistus*, *F. M. Bailey*. Superficially resembles some forms of *Merulius lacrymans*, Fries, but readily distinguished by the very much smaller spores.

Ascomycetes.

Apiosporium atrum, *Massee*.

Mycelium plagulas atras suborbiculares saepe confluenti-irregulares velutinas matrici arcte adnatas efficiens. *Perithecia* centro plagularum densissime aggregata, viva globosa, sicca cupulato-collapsa, basi setulis cincta, contextu indistincto atro, 200–300 μ. diametro. *Asci* ovati, deorsum in pedicello longissime producti, polyspori. *Sporae* cylindraceae, hyalinae, continuae, 9–12 × 2–2·5 μ ; adest status stylosporicus.

Federated Malay States. Kuala Lumpur : the dead branches of Para rubber trees, *C. K. Bancroft*.

Not considered as a parasite, but common on dead branches. Allied to *Apiospora australe*, Speg.

Physalospora immersa, *Massee*.

Perithecia sparsa, immersa, hyalina, circa 300 μ diametro, ostiolo vix exserto donata, globosa, glabra, subcarbonaceo-membranacea, contextu parenchymatico subindistincto. *Asci* fusoidei, sursum acuminati, deorsum modice attenuato-stipitati, octospori. *Sporae* plus vel minus distichae, ellipsoideae, continuae, hyalinae, 6 × 4 μ.

Straits Settlements. Singapore: Botanic Gardens; on cattle dung, *I. H. Burkill.*

Allied to *P. disseminata*, Sacc., but distinguished by the shorter spores and clavate asci.

Ceratostomella coprogena, *Massee.*

Perithecia minuta, e conoideo subglobosa, atra, glabra, membranacea, 200 μ diametro, ostiolo elongato-acutato, contextu parenchymatico. *Asci* cylindraceo-clavati, apice obtuse truncati, octospori. *Sporae* ellipticae, hyalinae, 7 × 4·5 μ.

Straits Settlements. Singapore: Botanic Gardens; on cattle dung, *I. H. Burkill.*

Allied to *C. leiocarpa*, Sacc., differing in the smaller spores, and from all known species in its habitat.

Sordaria Burkillii, *Massee.*

Perithecia laxiuscule gregaria, semi-immersa, atro-olivacea, majuscula, 350 × 250 μ, ostiolo cylindraceo crassiusculo incurvo vertice rotundato-truncato atro piloso ornata. *Asci* cylindraceo-clavati, sursum obtusissime rotundati, deorsum in pedicellum attenuati, octospori. *Sporae* oblique monostichae, ellipticae, violaceo-brunneae, 28–33 × 18–20 μ, deorsum cauda cylindraceo-acutata hyalina facile decidua auctae.

Straits Settlements. Singapore: Botanic Gardens; on cattle dung, *I. H. Burkill.*

Most nearly allied to *Sordaria communis*, Sacc.

Deuteromycetes.

Gloeosporium cocophilum, *Wakefield.*

Acervuli erumpentes, sparsi vel aggregati, caulicoli, usque ad 0·5 μ diametro. *Conidia* cylindracea, hyalina, 13-21 × 5 μ, in massulis roseis irregularibus emergentia. *Conidiophores* fuscae, 15–20 × 2–3 μ.

West Indies. St. Vincent: On petioles of *Cocos nucifera*, *F. W. South*, 135, 136, 137.

In the recently published descriptions of Exotic Fungi, *K.B.*, 1912, p. 358, the locality for *Isaria Pattersonii*, Massee, was erroneously given as the Gold Coast, the material having been received from that Colony without definite information.

We learn from Mr. Patterson that this fungus was collected in the island of St. Vincent, West Indies, on the pentatomid *Nezara viridula*. Specimens of the fungus have recently been received at Kew from the island of Grenada through the Imperial Department of Agriculture for the West Indies.

XV.—NOTES ON TREES AND SHRUBS, IRELAND.

W. J. Bean.

The following notes were taken during a fortnight's visit to Ireland in February last. Several places visited are not dealt with in detail because an account of them has already appeared in the *Bulletin* (1906, p. 219–224) such as of Glasnevin, Castlewellan, Mr. T. Smith's nursery at Newry, and Mount Ussher.

Powerscourt, which I visited on February 12, provides a wonderful feast for the tree-lover in the numerous and beautiful specimens of *Abies Nordmanniana*, the Araucarias, a splendid *Abies grandis*, one of the finest *Nothofagus betuloides* in these islands, a golden weeping Nootka Sound cypress, and very attractive examples of *Cupressus torulosa*, *Picea polita*, *P. hondoensis* and *Fitzroya patagonica*.

At **Old Conna Hill**, a few miles from Powerscourt, is the seat of Capt. L. Riall, where some of the most admirable gardening in Ireland is done. The chief feature of the place is the pinetum not far from the house, where some very fine specimens may be seen. Thus of silver firs, *Abies Lowiana* is 60 ft. high, *A. Pinsapo* 55 ft., *A. religiosa* 70 ft. *Torreya californica* is 28 ft. high and *Pinus monophylla* 18 ft., probably the largest in the British Isles. *Castanopsis chrysophylla*, the Golden Chestnut of California, has a clean smooth trunk 1 foot in thickness. In an enclosed, old-world garden is a splendid *Cordyline australis* with a much branched head, and a trunk 6 ft. in girth, and bushes of *Erica arborea* 10 ft. high, shapely and dense. *Dendromecon rigidum*, the Californian, tree-poppy, is 12 ft. high against a wall, its main stem 6 ins. in thickness; Capt. Riall says it is always in flower. *Acacia dealbata* has been out 10 years and is now a charming tree 30 ft. high, thickly branched, its trunk 15 in. in diameter; on February 12, it was just opening the first of a great crop of flowers. *Genista fragrans*, too, 15 ft. high, growing against a wall was full of blossom.

A visit was paid to **Hamwood**, the home of Mr. Chas. R. Hamilton, near Dunboyne, where there is a very excellent selection of conifers and flowering trees and shrubs. I was attracted to Hamwood by hearing of the fine *Griselinia littoralis* there. Mr. Hamilton has both the male and female plants and the latter bears fruit freely. They are like small ivy berries and the seed they contain is quite fertile, young plants springing up all over the garden. This place appears to have been the first, perhaps as yet the only one, where *Griselinia littoralis* has borne fruit in this country. Among the conifers is a very fine *Pinus monticola* 70 to 80 ft. high which must be about the tallest in Ireland, and *P. aristata* is 20 ft. high. Other interesting plants of unusual size are *Fagus sylvatica* var. *cristata* 45 ft. high; *Retinispora ericoides* (a juvenile form of *Thuya orientalis*) 8 ft. high and 15 ft. through; *Berberis Darwinii* 18 ft. high. A beautiful spring effect is produced by

Anemone apennina which, introduced a good many years ago, has now spread itself amongst the trees and shrubs all over the grounds.

Rostrevor.

On the side of a hill sloping in the direction of Carlingford Lough is most beautifully situated the garden of Sir John Ross of Bladensburg. The garden is sheltered on the north by the Mourne Mountains, and on the southern side of the Lough are other picturesque mountains full in view. As may be judged from the presence of many of the plants mentioned below, the garden occupies a site that encourages the growth of tender plants in a way rarely experienced so far to the north. The hill on which it stands slopes abruptly to the south and is itself considerably elevated above the level of the sea. These various factors—the surrounding mountains, the nearness of the sea, the elevation of the garden itself above its immediate surroundings, and its full exposure to the south—are all in favour of the well-being of tender plants. It is fortunate for Irish horticulture that this spot is in the hands of so enthusiastic a collector and cultivator.

The publication of a list by Sir John two or three years ago of the plants cultivated at Rostrevor prepared one for seeing a large number of species of shrubs and trees there. It is one thing, however, possessing representatives of a great number of species and quite another growing them so well that they are a pleasure to look upon. It was a very gratifying experience to find such great numbers of rare plants so carefully tended and studied and to see them in such promising health and vigour. Sir John is a botanist and a student, but he is a gardener as well. Much of the hillside which he has given up to exotic vegetation was originally covered with gaunt spreading old laurels. It is amongst these he has planted his treasures, wisely using the laurels as windbreaks and for shelter generally, only reducing or removing them as the other things grow, secure a firm foothold, and need more space.

The shrubs most in prominence here are not those we see in the ordinary garden, but rather what we associate with the greenhouse. They do not represent the floras of Northern Europe, N. America and parts of N. Asia so much as those of Chile, Mexico, Australasia, S. Europe, S. Africa and the Himalaya. In a little walled in space there were, on the walls, *Genista elegans* 10 ft. high, *Cytisus proliferus* 12 ft. high, *Buddleia auriculata* 16 ft. high, and *Billardiera longiflora* bearing the remnants of a large crop of its brilliant blue fruits.

Conifers.—Among conifers growing in the open were such interesting and tender things as *Tsuga Brunoniana*; the three *Athrotaxis*—*A. cupressoides* (12 ft. high), *A. laxifolia* and the coarser-leaved *A. selaginoides*; *Dacrydium Franklinii*, *Callitris oblonga* bearing many cones, *C. robusta*, and their curious ally from N. Africa, *Tetraclinis articulata*. The New Zealand "Totara," *Podocarpus Totara*, although only about 5 ft. high, was thriving

well, as was also the curious and very distinct *P. Nageia* from Japan. *Juniperus Cedrus* was succeeding well; this juniper, now nearly extinct on its native mountains in the Canary Islands, has latterly been brought into prominence by Dr. Perez of Orotava, Teneriffe, who in recent years has interested himself much in its preservation and distribution. The fine Chinese *Libocedrus macrolepis*, whose tenderness in such places as Kew has been a great disappointment, appeared quite at home, as did also its New Zealand ally, *L. Doniana*. *Abies religiosa*, the rare Mexican silver fir, increases in height here at the rate of 2 ft. annually. Finally, may be mentioned *Keteleeria Fortunei*, of which so magnificent an example grows in the nursery of Messrs. Rovelli at Pallanza (see *Kew Bulletin* 1912, p. 288); here at Rostrevor is one of the few plants I have seen thriving out of doors in the British Isles.

Australian Shrubs.—An interesting feature of the collections is the number of Australian shrubs they contain. We are accustomed to the presence of New Zealand plants in our gardens but Australian ones are rare. At Kew, only one shrub from that country is really hardy in the open—*Podocarpus alpina*. As examples showing the richness and interesting nature of the open air collections at Rostrevor may be mentioned: *Hibbertia Readii*, *Sollya heterophylla* (self-sowing), *Leucopogon Richei*, *Hakea ulicina*, *H. pugioniformis*, *Acacia verticillata*, *A. pycnantha* (25 ft. high), *Pomaderris apetala*, *Lomatia longifolia* (4 ft.), *Olearia Gunniana* (7 ft. in height and diameter), *Muehlenbeckia varians*, whose thin wiry stems form a tangled mass 15 ft. in diameter, and about as high. Various species of *Leptospermum* of course abound; they even spring up as self-sown seedlings about the grounds, but a plant 6 ft. high of *L. Nicholi*—the shrub which gained the award for the best new plant at the International Show last May—was a pleasant surprise. There is a great collection of Olearias, Pittosporums, Senecios, and Coprosmas, many of which belong to New Zealand.

The number of plants grown is so large that space will not allow of mention of more than a small proportion of them, but of especial interest were *Anopteris glandulosa* from Tasmania, a beautiful evergreen with racemes of bell-shaped flowers; *Libonia floribunda*, well known in greenhouses for its orange-coloured flowers; *Feijoa Sellowiana*; *Philesia buxifolia*, a patch 4 ft. through; *Arbutus furiens*, an interesting and very distinct Chilean species; an interesting series of Cassinias; *Vaccinium Mortinia*, that dainty little evergreen which grows on the Andes of Ecuador almost on the equator; *Mitraria coccinea*, extraordinarily luxuriant; *Cyathodes empetrifolia*, a curious and pretty Epacrid from Australasia; *Prinsepia* (*Plagiospermum*) *sinense* was in flower, but does not appear likely to justify the praises bestowed on it by German periodicals (see *Kew Bull.* 1909, p. 354); *Ilex insignis*, perhaps the finest of all hollies; *Eupatorium Weinmannianum*, 9 ft. high.

There were fine plants also of things so typical of Irish gardens as *Tricuspidaria lanceolata*, *Embothrium coccineum*, *Drimys Winteri*, 30 ft. high, and *D. aromatica* with its handsome red twigs; *Olearia macrodonta* 20 ft. through; *Rhododendron Griffithianum* 10 ft. high; *Berberidopsis corallina* in rampant growth.

Kilmacurragh.

In the middle latitudes of Ireland there appears to be nowhere so remarkable a collection of rare and tender trees as that at Kilmacurragh in co. Wicklow. In point of numbers the collection does not equal that of Sir John Ross of Bladensburg, at Rostrevor, but, as will be seen from the following notes, the individual specimens have attained unusually fine dimensions, and they are almost invariably in the most robust health. The collection was largely formed by the late Mr. Thomas Acton, who was one of the keenest of plant lovers even in Ireland, where there is now a considerable community, encouraged and fostered by that admirably managed centre, Glasnevin. On Mr. T. Acton's death, Kilmacurragh descended to his nephew, Capt. Acton, in whose hands the collection of trees and shrubs is being admirably maintained.

One great charm of the Kilmacurragh plants is the semi-wild surroundings in which they are placed. They do not stand isolated on trim lawns, as at Castlewellan for instance, but occupy openings in the woodland, of which, indeed, they form a part. Each style of treatment has its charms, but to one like myself, whose habitual surroundings are of the neat, trim, and essentially garden type, the untrammelled order of things at Kilmacurragh appeals with perhaps undue force. And behind it all is that sense of satisfaction engendered by the rude health of the plants.

As elsewhere in Ireland, it is the plants of Tasmania, New Zealand, and Chile that predominate and give such interest to the garden, but they are supplemented by a strong contingent from the Himalaya. Of those belonging to Tasmania none are of greater interest than the three species of *Athrotaxis*: *A. cupressoides*, 20 ft. high; *A. laxifolia*, a pyramid 35 ft. high with a base 15 ft. in diameter; and *A. selaginoides* 35 ft. high, with a trunk 12 in. thick. Of New Zealand species the remarkable *Fuchsia excorticata*, 15 ft. high, its bark peeling off in long strips, was just coming into flower; *Senecio Greyi*, 6 ft. high and 10 ft. through, I do not remember to have seen so large elsewhere; *Griselinia littoralis* was 20 ft. high and formed a small tree.

Other particularly fine Australasian trees are *Nothofagus Cunninghami* 40 ft. high, its trunk 17 in. thick, probably the finest tree of its kind in the British Isles; *Nothofagus Moorei*, an evergreen species with larger leaves than most of these Southern beeches, 25 ft. high; *Pittosporum Buchanani* 15 ft. high.

Himalayan trees and shrubs are strongly represented at Kilmacurragh, and among them of course the rhododendrons stand first. The only species I saw in flower was *R. Shepherdi*, a brilliant red-flowered species in the way of *R. barbatum* but with larger calyx lobes; *R. Falconeri* is a wonderful bush 20 ft. high and more in diameter, and its close ally or variety *R. eximium* is also very vigorous; the tender *R. calophyllum* is useful in bearing its white funnel-shaped flowers later than most; *R. triflorum* and *R. campylocarpum* both 10ft. high; *R. grande* (*argenteum*) 16 ft. in height and in diameter. *R. lacteum*, one of the rarest of Chinese species, is 10 ft. high. Besides these there is a host of trees and bushes of

the red- and rose-flowered *arboreum* group. The rare *R. Keysii* is about 10 ft. high. Apart from rhododendrons the following stood out conspicuously good among Himalayan plants: *Abies Pindrow* about 50 ft. high with a trunk 2 ft. in diameter; *A. Webbiana* vividly blue-white beneath the leaves, also 2 ft. in thickness of trunk; *Magnolia Campbellii*, planted against a wall which it had long overtopped, being now 30 ft. high, its still leafless shoots bearing many flower-buds; *Tsuga Brunoniana*, rarest of hemlocks, 35 ft. high and more in width; *Pieris formosa*, bushes 15 ft. high. *Leycesteria formosa*, which we are accustomed to regard as an eminently staid bush, seems at Kilmacurragh to have lost control of itself and run riot as a sort of climber among tree branches 20 ft. from the ground.

Chilean Plants.—But after all, in overhauling one's notes, one finds that it is the Chilean trees and shrubs more than any others that give to the grounds at Kilmacurragh their great distinction. The vegetation of temperate South America seems to find in the Irish climate conditions as congenial to them as perhaps any other part of the British Isles affords; in this respect at any rate it equals the climate of Cornwall or the West of Scotland. Is there anywhere, for instance, a finer *Embothrium coccineum* than the one at Kilmacurragh, 40 ft. high with a trunk 18 in. thick and sending up suckers 20 ft. away? or than *Tricuspidaria lanceolata*, 20 ft. high and 15 ft. through? Of a remarkable series of Chilean conifers, mention must be made of the following: *Prumnopitys elegans* 30 ft. high with a trunk 1 ft. thick; two beautiful examples of *Podocarpus nubigena* 23 ft. high and 20 ft. through, the foliage of a charming, fresh green, the young shoots bright yellow; *Libocedrus chilensis* 30 ft. high and the very rare *L. tetragona* 20 ft. high; *Fitzroya patagonica* 25 ft. in height and diameter; *Podocarpus chilina* 25 ft. high, more in width, its trunk 15 in. in thickness.

Other notable Chilean plants are *Drimys Winteri* 35 ft. high; *Azara microphylla* 30 ft., in full blossom in February, its myriads of tiny blossoms strongly vanilla-scented; *Eugenia apiculata* (*Myrtus Luma*) 25 ft. high and 20 ft. through; *Laurelia aromatica*, a small tree which flowered and bore fruit several years ago, now 40 ft. or so high.

The Mexican sylva has two fine representatives in *Cupressus lusitanica* 40 ft. high, and *Abies religiosa*—one of the rarest of silver firs—its trunk 2 ft. in diameter.

Of better known things *Pinus Balfouriana* is 16 ft. high; *Eurya japonica* 7 ft.; *Cupressus pisifera squarrosa* 30 ft. and *C. thyoides* var. *leptoclada* 20 ft. high, the latter with several slenderly pyramidal branches growing outwards and giving it a diameter of 20 ft.; *Ilex Perado*, a Madeiran holly bearing much fruit, is 20 ft. by 25 ft. in diameter; a tea plant (*Camellia theifera*) is a bush 6 ft. through; *Leucothoe Catesbaei* is 7 ft. high.

Headfort.

The Marquis of Headfort has just founded a very extensive pinetum here. He has devoted an island of about 9 acres in

extent to the cultivation of as complete a collection of Coniferae as he has been able to get together. The climate of Headfort may not be quite so favourable to the growth of tender conifers as that of such places as Kilmacurragh, or Rostrevor, still less Fota, but the soil is excellent and the site moist—two factors very conducive to the well-being of the vast majority of conifers, especially spruces, firs, cedars, cypresses and members of the Taxaceae. The magnificent dimensions that such conifers as larch and common silver fir have attained in old plantations on the estate afford very encouraging prospects for the newly-founded pinetum, the first trees of which were planted on February 17. No one site will ever be found to suit all conifers—the moist mild conditions that so admirably meet the needs of Chilean, New Zealand and many British Columbian species cannot be perfectly adapted to the pines say of N.E. America, or the species from the hot and often arid regions of Arizona and other of the S.W. United States. But, on the whole, I believe the delightfully picturesque site selected by Lord Headfort will be found to support in health and vigour as large a number of species as any one place of similar size in the British Isles. It is appropriate to record the foundation of this collection in these pages, because it promises to be as complete in a botanical sense as any private collection in the Kingdom.

Avondale Forestry Station.

An interesting and useful work in experimental forestry has been initiated on the estate of the late Charles Stewart Parnell at Avondale, some 550 acres of which have been acquired by Government for the purpose. It lies at from 250 to 400 feet elevation and its eastern boundary is the River Avonmore, to the beautiful valley of which one part of the estate slopes abruptly. The chief object of the station is to test the value of exotic timber trees in Ireland and, incidentally, to provide a place of training for young men desirous of taking up forestry as a profession. The work was only started in 1905, and the eight years that have elapsed since then do not, of course, constitute a long enough period for any very striking or conclusive results to have been arrived at. In another ten or even five years the plots will have become more interesting. Much of the ground was originally pasture, and since it was laid down in forestry a strong growth of grass has established itself. This the young trees will in time destroy, as they already have done in some plots, but until then a genuine forest bottom cannot be said to have been established.

The scheme adopted is at once simple and effective. A broad avenue extends across the land, at each side of which have been planted one-acre blocks of various exotic trees. They are usually mixed with other trees intended to serve as temporary nurses, but sometimes they are planted in pure blocks. Standing out in the avenue opposite each block is a single isolated specimen of the same species as the one of which the block is composed. It has sufficient space to allow of its attaining the dimensions and form of the finest type of park tree.

The trees planted are those whose timber value in their native homes is known to be great, the general idea being to test their fitness for the climate of Ireland. The behaviour of many of the commoner timber trees is, of course, known, but the Station is endeavouring to demonstrate the value of rarer and lesser known trees under forest conditions. At present about 100 plots have been planted in this way.

As might be anticipated, a varying success has attended the different plantations, but the initial stages of growth do not always correspond in vigour to later ones. A bad starter may ultimately overtake and out-distance a good one. Among the most promising exotic growths at the present time are Japanese larch (*Larix leptolepis*), whose handsome brown shoots make beautiful breadths of colour; *Abies grandis*, whose growth much exceeded that of the common silver firs associated with it; Corsican pine looked well planted partly in association with larch, partly with spruce, and partly pure. *Cupressus macrocarpa* and *Juniperus virginiana* are growing rapidly, and *Tsuga Albertiana* is full of promise. The green-leaved Douglas fir planted on the low, sheltered flat near the river is in vigorous growth—much superior to the glaucous-leaved Colorado form.

In the vicinity of the house has been established an arboretum where the object is to show the value of trees in the garden and park, some being given sufficient space to enable them to develop as specimen trees, whilst others are associated in groups for landscape effect. Between 250 and 300 species have been planted here, over 100 of them being conifers.

Parnell's old house, interesting for its fine doors, ceilings and fireplaces, and for its balconied hall, is used as a museum and to provide class and lecture rooms for the students. The walled-in kitchen garden is given up to the raising of forest trees from seed, and now contains many thousands of trees, more especially of those kinds difficult to obtain through ordinary trade channels. A collection of Irish-grown timbers is being got together.

The course of training given at Avondale is strictly practical, that is to say, the young men have to use the spade, axe, and saw, and although the theoretical and scientific side of forestry is an important part of the training, the apprentices are workers first and foremost. A competitive examination is held in Dublin every September of those who present themselves as candidates for employment. The selected men are then sent to Dundrum, Co. Tipperary, for one year's manual training, after which they are further examined and reported on by the Forester in charge, and, if satisfactory, are passed on to Avondale for a further two years' course. Here they perform the ordinary work of the station during the day, and in the evening receive classroom instruction in forestry, elementary science, surveying, &c. They have free tuition, board and lodging, and are paid five shillings per week. The aim of the management is to turn out working foresters of a superior and intelligent type, and the young men preferred are those who satisfy the authorities not only of their general intelligence, but also that they are capable of manual labour and willing to do it.

The detailed particulars of the "Course of Training for Working Foresters" are reprinted in the footnote.*

XVI.—DECADES KEWENSES.

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS LXXII.

711. **Cotylelobium lanceolatum**, *Craib* [Dipterocarpaceae]; a *C. flavo*, Pierre, foliis minus coriaceis, indumento tenuiore distinguendum.

Folia lanceolata vel oblongo-lanceolata, apice acuminata, obtusiuscula, mucronulata, basi late cuneata vel rotundata, plerumque parum inaequilatera, 5·5–7·5 cm. longa, 2·1–2·7 cm. lata, subcoriacea, pagina superiore glabra, inferiore pilis brevibus stellatis costa densius nervis nervulisque parcius instructa, nervis lateralibus primariis utrinque 10–12 rectis angulo circiter 70° e costa ortis intra marginem anastomosantibus, nervis lateralibus secondariis numerosis primariis parallelis, costa supra leviter impressa subtus prominente, nervis nervulisque supra conspicuis vel subconspicuis

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* *Course of Training for Working Foresters.*

The Department provide a course of training in practical forestry, with a view to creating a class of working foresters suitable for employment on the Department's Forestry Centres, or on private estates throughout the country in general. An examination is held in Dublin in September of each year, for the purpose of selecting apprentices from the candidates presenting themselves. The examination includes Arithmetic, English Composition, and Dictation. Preference is given to those candidates who have had experience of forestry or other outdoor work, and are likely to adapt themselves to future training. Selected candidates are required to undergo a year's manual training at Dundrum, Co. Tipperary, where the Department are gradually clearing and re-planting a large area of woodland. They are paid at the rate of 14*s.* per week and provided with free lodgings in the bothy attached to the Centre. Instruction is given in Arithmetic, Business Correspondence, Mensuration, &c., together with the Elements of Practical Forestry, after working hours.

Upon completing one year satisfactorily at Dundrum, apprentices are required to undergo a further examination. Those who successfully pass this examination, and whose conduct and industry during the previous year are favourably reported upon by the Forester in charge, are then transferred to the Avondale Forestry Station for a further course of training. At Avondale the apprentices are required to take part in the general work of the Station by day, and receive classroom instruction in Forestry, Elementary Science, Surveying, &c., during the evenings. The full course at Avondale extends over two years, and while there the apprentices receive free tuition, board and lodging, in addition to a wage of 5*s.* per week. Apprentices who successfully pass through the course are given, as vacancies occur, employment as Working Foresters or Foreman on the Department's Forestry Centres, but the Department do not undertake to provide or guarantee employment to any time-expired apprentice.

The course of training may be terminated at any time by giving one week's notice on either side, and any apprentice who fails to conduct himself properly, conform to the rules or regulations laid down by the Department's officers, or make satisfactory progress in his training or class work, will be required to terminate his course at the discretion of the Department.

subtus prominulis, margine parum revoluta, petiolo 0·75–1·1 cm. longo tomentello suffulta. *Pedicelli* breves. *Sepala* lanceolata vel sublanceolata, apice acuta vel acutiuscula, 8–9 mm. longa, circiter 2·75 mm. lata, utrinque tomentella. *Antherae* 3·5 mm. longae, breviter apiculatae, connectivo dorso parce pubescente, filamentis brevibus. *Ovarium* hirsutum; stylus sepalis paulo brevior, inferne pubescens.

Siam. Described from a specimen communicated for identification by the Eastern Asiatic Co. who state that the wood is known in Siam as "Kiam wood."

712. **Wightia Lacei**, *Craib* [Scrophulariaceae - Cheloneae]; a *W. gigantea*, Wall., inflorescentiae indumento crassiore, corolla majore, fructu angustiore longiore recedit.

Arbor 30-metralis vel ultra (ex *Lace*); ramuli primo dense rufo-stellato-tomentelli, mox glabri, nodis parum compressi, cortice pallide brunneo parce lenticellato obtecti. *Folia* opposita, ovata, late oblonga vel subelliptica, apice breviter acuminata, obtusa, basi cuneata vel rotundato-cuneata, 6·5–13 cm. longa, 3·3–7·5 cm. lata, subcoriacea, supra glabra, subtus costa nervisque praecipue pilis stellatis brevibus parce instructa, nervis lateralibus utrinque 4–5 cum nervis transversis supra leviter immersis subtus conspicuis, petiolo 2–2·5 cm. longo densius rufo-stellato-tomentello suffulta. *Thyrsi* axillares, ascendentes vel mox arcuati, angusti, ad 13 cm. longi, rhachi pedunculoque dense rufo-stellato-tomentellis; pedunculi partiales breves; pedicelli ad 5 mm. longi. *Calycis* tubus 6 mm. altus, 8 mm. diametro, lobi 3, circiter 4 mm. longi et 6 mm. lati, acutiusculi. *Corollae* tubus 1·9 cm. longus, apice 1·2 cm. diametro, lobus infimus oblongus, 1 cm. longus, 8 mm. latus, lobi laterales 1·2 cm. longi, 9 mm. lati, duo supremi in unum ad medium bifidum 1·3 cm. longum 1·2 cm. latum lobis rotundatis connati; corolla extra stellato-pubescens, intra staminum insertionem prope pilosa. *Filamenta* longiora 4·3 cm. longa, breviora 3·7 cm. longa, basi pilosa. *Ovarium* 4 mm. altum, ad 4·5 mm. diametro; stylus 4·2 cm. longus. *Fructus* vix maturus, 4 cm. longus, 8 mm. latus, fuscus.

Indo-China. Burma: Amherst, near Kaw Ngaw stream, 900 m., *Lace*, 5653.

713. **Boea birmanica**, *Craib* [Gesneraceae - Cyrtandreae]; a *B. Swinhoei*, C. B. Clarke, calyce corollaque majoribus distinguenda.

Herba erecta, 10–21 cm. alta; caules solitarii, albo- vel mox cinnamomeo-lanati. *Folia* oblonga vel suboblonga, apice acutiuscula vel obtusa, basi acuminata, marginibus fere ad petioli basin decurrentibus, 3–5·5 cm. longa, 1·2–2·5 cm. lata, rigida, supra adpresse vel subadpresse pubescentia, subtus albo- vel mox fere cinnamomeo-lanata, nervis lateralibus utrinque 7 supra obscuris vel subobscuris subtus prominentibus, nervis transversis paucis subtus conspicuis, margine leviter crenata vel crenato-serrata; petioli foliorum oppositorum parum inaequales, ad 3·5 cm. longi, ut caules lanati, basi, praecipue foliorum inferiorum, caulem amplectentes. *Sepala* plus minusve sub anthesin cohaerentia, lineari-lanceolata, acutiuscula, parum inaequalia, ad 8 mm. longa, circiter 1 mm. lata, extra lanata, intra glabra. *Corolla* 1 cm. longa, tubo lobis duplo

longiore intra hic illic pilis albis longiusculis instructo, lobis subaequalibus, apice rotundatis ad 4 mm. latis. *Stamina* 2, glabra, staminodiis parvis. *Capsula* calyce persistente sesqui vel fere duplo longior, ad 3 mm. diametro, fusco-brunnea, glabra.

INDO-CHINA. Upper Burma: Maymyo Plateau, 1050 m., *Lace*, 5882.

714. **Ornithoboea Henryi**, *Craib* [Gesneraceae-Cyrtandreae]; ab *O. Parishii*, C. B. Clarke, labii inferioris lobis oblongis breviusculis obtusis recedit.

Herba, caule pilosulo; rhizoma 2–4 mm. diametro, foliorum delapsorum petiolorum basibus vestitum. *Folia* inaequilatera, late ovata vel subelliptica, apice, saltem juventute, acuminata, acuta, basi cordata, rotundata vel latere altero rotundata, altero late cuneata, 2–10·5 cm. longa, 2–5 cm. lata, membranacea, nervis lateralibus utrinque circiter 6 pagina utraque conspicuis, supra breviter pilosula, subtus costa nervisque puberula, petiolo ad 11 cm. longo pilosulo suffulta. *Inflorescentia* generis; pedicelli fructescentes ad 1·4 cm. longi, pilosuli. *Sepala* late lanceolata vel oblanceolata, apice acuminata, acuta, infructescentia reflexa, ad 6 mm. longa et 2 mm. lata, utrinque pilosula. *Corollae* tubus 4 mm. longus; labium inferum 5·5 mm. longum, basi 1·5 mm. latum, 3-lobatum, lobis oblongis apice rotundatis ad 3 mm. longis et 1·5 mm. latis, medio basi pilosum; labium superum e lobis duobus late oblongis apice rotundatis 2·5 mm. longis 2 mm. latis constitutum, basi linea lanata ad labii inferi basin producta instructum. *Stamina* 2; staminodia 3, tertium minutum. *Fructus* ad 1·5 cm. longus et 2·5 mm. diametro, pilosus.

CHINA. Yunnan: Puerh, 1350 m., *Henry*, 13,378.

715. **Ornithoboea Lacei**, *Craib* [Gesneraceae-Cyrtandreae]; ab *O. Parishii*, C. B. Clarke, foliorum nervis prominulis, floribus multo majoribus, labii inferioris lobis truncatis emarginatis facile distinguenda.

Rhizoma ad 11 cm. longum, 5–6 mm. diametro, ambitu plus minusve quadrangulare, petiolorum basibus persistentibus dense obtectum, apicem versus praecipue densius pilosum; caulis circiter 27 cm. altus, fere e basi floriferus, glanduloso-pilosulus. *Folia* valde inaequilatera, late ovata, apice acuminata, acutiuscula, basi rotundata, latere uno altero usque ad 7 mm. altius terminata, 3·5–8·7 cm. longa, 2·5–5·4 cm. lata, chartacea vel tenuiter chartacea, utrinque pilosula et subtus minute aureo-glandulosa, nervis lateralibus utrinque ad 10 supra conspicuis subtus prominentibus, nervis transversis subtus prominulis, duplo-crenata vel crenato-serrata, petiolo ad 5·5 cm. longo glanduloso-pilosulo suffulta. *Inflorescentia* generis; pedicelli ad 1·5 cm. longi, glanduloso-pilosuli. *Sepala* inter se subaequalia, oblongo-oblanceolata vel late oblongo-oblanceolata, apice acuminata, acuta, ad 7 mm. longa, 3·5 mm. lata, utrinque pilosula. *Corollae* tubus 7 mm. longus, apice lanatus; labium inferum tubo aequilongum, e lobis tribus oblongis apice truncatis emarginatis inter se paulo inaequalibus (mediano lateralibus parum latiore) vix 5 mm. longis ad 3·5 mm. latis constitutum; labium superum e lobis 4 brevibus apice rotundatis inter se subaequalibus pseudo-constitutum (i.e. e lobis duobus altius bifidis

constitutum). *Stamina* 2, antheris majusculis ; staminodia 3, supero minuto. *Ovarium* circiter 2 mm. altum, dense glandulosum ; stylus 5 mm. longus. *Fructus* ad 1·5 cm. longus, 2·5 mm. diametro, glanduloso-pilosus et parce aureo-glandulosus.

INDO-CHINA. Upper Burma : Maymyo Plateau, 1050 m., *Lace*, 5926.

716. **Thunbergia Lacei**, *Gamble* [Acanthaceae-Thunbergieae] ; ab affini *T. grandiflora*, Roxb., ramulis longe setosis, foliis majoribus palmatis molliter pubescentibus, floribus axillaribus pedunculatis recedit.

Frutex scandens ; ramuli pubescentes et longe setosi, setis saepe fere 5 mm. longis et transverse divisis. *Folia* palmata (juniorave ovato-cordata, vix lobata), 7–11-lobata, basi profunde cordata, apice acuta, mucronata, fere ad 20 cm. longa et lata, pagina utraque molliter pubescentia, margine praeter lobos integra ; costae e basi 7, mediana utrinque nervis circiter 3 patentibus, lateralibus cito divisis, reticulatione subtus conspicua ; petiolus ad 13 cm. longus, basi incrassatus tortusque, conspicue pubescens et setosus. *Flores* 1–4, e foliorum axillis ; pedunculi crassi, circa 5 cm. longi, infra flores expansi, setosi ; bracteae 2, ovato-oblongae, acuminatae, 3 cm. longae, deciduae. *Calyx* florifer subinteger vel parce crenulatus, pubescens, fructifer auctus, lobis circiter 5 acuminatis. *Corolla* coerulea, fauce flava ; tubus inferne constrictus, deinde campanulatus, ad 3 cm. longus ; lobi rotundati, ad 4 cm. diametro. *Stamina* 4 ; filamenta lata, basi solum pubescentia ; antherae oblongae, basi calcaratae, interdum 2 breviores calcare uno brevi altero longiore, setosae ; connectivum in apicem conicum productum. *Ovarium* depresso-conicum ; stylus gracilis, ad 2 cm. longus ; stigma infundibulare, bilobum. *Capsula* globosa, circiter 1 cm. longa, in rostrum 2–3 cm. longum producta. *Semina* 4, triangularia, facie exteriore corrugata, interiore plana, 7–9 mm. lata.

INDO-CHINA. Upper Burma : Maymyo Plateau, 1050 m., *Lace*, 5419 ; Southern Shan States : Maha Choung ; Loilong, 600 m., *Robertson*, 97.

717. **Helicia Curtisii**, *Gamble* [Proteaceae - Grevilleae] ; ab *H. robusta*, Wall., cui quoad folia affinis, racemis brevioribus, perianthio minore graciliore et squamis hypogynis liberis recedit.

Arbor ad 6–9 m. alta ; ramuli teretes, pallide brunnei, glabri. *Folia* oblanceolata, apice obtuse acuminata, basi longe attenuata, 12–18 cm. longa, 4–6 cm. lata, chartacea, supra glabra, siccitate olivacea, infra pallida, rufescentia, costa gracili infra prominente, nervis lateralibus utrinque 8–10 marginem versus curvatis et ibi arcuatim junctis infra praecipue prominentibus, nervis transversis paucis reticulationem areolatam formantibus, margine supra medium conspicue serrata, serraturis acutis aliquando 1–2 in 1 cm., infra medium integra ; petiolus circiter 1 cm. longus, laminae marginibus fere ad basin decurrentibus. *Paniculae* racemiformes, axillares, graciles, 15–20 cm. longae, rhachi ramulis pedicellisque primo parce ferrugineo-puberulae, tandem glabrescentes ; ramuli 2 mm. longi, biflori, pedicellis 2 mm. longis ; bracteae bracteolaeque minutae, caducae. *Perianthium* in alabastro clavatum, gracile, tenue, 7–8 mm. longum, lobis oblongis acutis ; squamae hypogynae

liberae, ovatae, obtusae, 1 mm. longae. *Stamina* 4, antheris oblongis, connectivo apiculato, filamentis brevibus complanatis. *Ovarium* ovoideum, ferrugineo-villosum, stylo 5–6 mm. longo gracillimo, stigmate anguste cylindrico.

MALAY PENINSULA. Penang: Penara Bukit, *Curtis*, 3020.

718. **Helicia Scortechinii**, *Gamble* [Proteaceae - Grevilleae]; *H. excelsae*, Blume, affinis sed foliis siccitate fere nigris, petiolo breviore, racemis brevibus differt.

Arbor (?) ramulis teretibus pallide brunneis, junioribus paulo puberulis. *Folia* oblanceolata, apice abrupte caudato-acuminata, basi cuneata, 12–18 cm. longa, 4–6 cm. lata, chartacea, supra siccitate fere nigra, glabra, infra perparce fusco-pubescentia, costa gracili infra prominente, nervis lateralibus utrique 8–10 marginem versus curvatis et ibi arcuatim junctis infra prominentibus, nervis transversis irregularibus ramosis reticulationem irregularem formantibus, margine basin versus integra, apicem versus ad partem tertiam serrata; petiolus circiter 1 cm. longus, laminae marginibus fere ad basin decurrentibus. *Paniculae* racemiformes (juniores tantum) e foliorum delapsorum axillis ortae, singulae vel geminae, minute ferrugineo-hirsutae; pedicelli breves, biflori; bracteae ovatae, acuminatae, 2 mm. longae; bracteolae 1 mm. longae. *Perianthium* in alabastro clavatum, squamis hypogynis ovatis glabris liberis. *Ovarium* glabrum, stylo brevi, stigmate cylindrico-clavato.

MALAY PENINSULA. Perak, *Scortechini*, 467.

719. **Amomum Robertsonii**, *Craib* [Scitamineae-Zingibereae]; ab affini *A. dealbato*, Roxb., floribus minoribus, staminodiis majoribus, anthera minore recedit.

Folia late oblanceolata vel oblongo-oblanceolata, apice acuminata, acuta, basi obtusa vel in petiolum brevem attenuata, 15·5–33 cm. longa, 5·5–8·5 cm. lata, supra glabra, subtus imperfecte sericea; ligula ovato-oblonga, ciliata, dorso breviter densius pubescens, circiter 5 mm. longa; vaginae infimae 4, ut superiores puberulae. *Spicae* radicales, subsessiles, densae, subglobosae; bracteae exteriores late ellipticae, vix 2 cm. longae, 1·5 cm. latae, dorso tenuiter pubescentes, interiores lineari-lanceolatae, dorso parce pubescentes. *Calyx* circiter 2 cm. longus, parce pubescens; lobi late lanceolati, acuti, cornuti, ad 7 mm. longi. *Corollae* tubus circiter 2 cm. longus, superne praecipue substrigosus; lobi inaequales, ad 1·4 cm. longi. *Staminodia* lateralia fere filiformia, 1·5 mm. longa; labellum obovatum, circiter 1·8 cm. longum, et 1 cm. latum, intra medio strigosum, extra glabrum; anthera circiter 1 cm. longa, apice connectivo producto coronata. *Ovarium* vix 5 mm. altum, dense albo-hirsutulum.

INDO-CHINA. Upper Burma: Southern Shan States, in pine and mixed forest, 1350 m., *Robertson*, 150.

720. **Paspalum paschale**, *Stapf* [Gramineae-Paniceae]; affine *P. suffulto*, Mikan, sed rhachibus spicarum latioribus, spiculis rhachium flexuris insertis haud patulis paululo majoribus acutioribus distinctum.

Gramen perenne, caespitosum. *Culmi* florentes ad 45 cm. alti, cum innovationibus dense fasciculati, fasciculis rhizomati brevi insidentibus, inferne compressi, paucinodi, praeter nodos inferiores

barbatos glabri, e foliorum plurimorum axillis ramos erectos edentes. *Folia* basalia 5–7 vaginis valde compressis in dorso carinatis glabris vel saepius ad latera et ora versus pilosis ; ligulae brevissimae, ciliolatae ; laminae lineares, arcte plicatae, in statu plicato a latere visae apice curvatae, subapiculatae, 14–20 cm. longae, 5–7 mm. latae (explicatae), rigidulae, glabrae vel sparse villosae. *Spicae* 3–4 subdigitatae, 6–8 cm. longae, strictae ; rhachis flexuosa, 0·5 mm. lata, ad margines scabridula. *Spiculae* circiter 2 mm. distantes, in flexuris rhachis receptae, 2·5–3 mm. longae, oblongae, acutae, pallidae. *Gluma* inferior suppressa, superior spiculam aequans, ad latera viridula, caeterum hyalina, apicem versus et saepe ad nervos inferiores pilosula, nervis margines versus utrinque 2, brevibus tenuibus obscuris 3–4 intermediis additis. *Anthoecium* inferum ad valvam glumae superiori simillimam nisi tenuius nervosam reducta. *Anthoecium superum* 2–2·5 mm. longum, valva paleaque firmulis obtusis albidis.

Easter Island. Common on the hill of the middle island, Comm. *F. Fuentes.*

XVII.—DIAGNOSES AFRICANAE. LIII.

1431. **Mesembryanthemum minusculum**, *N. E. Brown* [Ficoideae-Mesembryeae] ; affinis *M. minuto*, Haw., sed corpusculis convexis nec depresso-emarginatis purpureo-maculatis et minutissime albo-punctatis area centrali minute puberula differt.

Herba parva, acaulis, succulenta, dense caespitosa, fere glabra, aphylla. *Folia* in corpuscula obovoidea, apice convexa, 5–8 mm. diametro fusa, area minute puberula circumdata et in annulo atro-virente inclusa, viridia vel lateribus purpureo-tinctis, purpureo-maculata vel atro-viridi-maculata et minutissime albo-punctata, fissura 1–2 mm. longa. *Calyx* in corpusculum inclusus. *Corolla* gamopetala, 2·5 cm. diametro, pulchre rubro-purpurea, luteo-oculata ; tubus supra superficiem plantae 3–6 mm. exsertus, compressus, 2 mm. latus, sordide aurantiaco-ruber ; petala exteriora circiter 16–18, sub-uniseriata, 12 mm. longa, 1·5–3 mm. lata, lineari-cuneata, obtusa vel subdentata ; interiora circiter 6, uniseriata, 3 mm. longa, linearia, acuta, auriantiaco-lutea. *Stamina* inclusa, lutea.

South Africa : without locality, described from living plants received at Kew from *Mr. N. S. Pillans* in 1908.

The flowers of this species, when once expanded, remain open until they fade, irrespective of sunshine or dull sunless weather and last 4–5 days.

1432. **Mesembryanthemum fraternum**, *N. E. Brown* [Ficoideae-Mesembryeae] ; affinis *M. minuto*, Haw., sed corpusculo punctato et floribus minoribus differt.

Herba parva, acaulis, succulenta, dense caespitosa, aphylla, glabra. *Folia* in corpuscula obconica, apice late rotundata vel emarginata, 0·7–1 cm. diametro fusa, pallide cinereo-viridia, haud nitida, punctis atroviridibus demum purpureis irregulariter conspersis notata, fissura haud ciliata. *Calyx* in pedunculo 1–2 mm. longo exsertus, 4-lobus ; lobi 2 mm. longi, erecti, oblongi, obtusi, membranaceo-marginati. *Corolla* gamopetala, 1·5 cm. diametro ; tubus

6 mm. longus, luteus ; petala 21–28, biseriata, subaequalia, patula, 6 mm. longa, 1–1·5 mm. lata, linearia, obtusa, pulchre rosea, basi lutea, leviter nitida. *Stamina* breviter exserta ; filamenta aurantiaca ; antherae luteae. *Stylus* staminibus sublongior, filiformis, apice minute 4-lobus, rubro-aurantiacus.

South Africa. Little Namaqualand : common on decomposed granite on the upper north-western slopes of hills south-west of Chubiessies, *Pearson*, 6177.

Described from living plants collected during the Percy Sladen Expedition to the Orange River in 1910–1911, by Prof. H. H. W. Pearson, and sent to the Royal Botanic Gardens, Kew, where it flowered in July and August, 1912.

The flowers seen opened in the morning of a day on which there was an entire absence of sunshine, and the temperature in the open air only 60° Fahr. They did not close, so far as I observed, unless during the night, but remained open until they faded, the weather being very dull and cloudy all the time.

1433. **Mesembryanthemum globosum**, *N. E. Brown* [Ficoideae-Mesembryeae] ; affinis *M. minimo*, Haw., sed corpusculis majoribus apice convexis nec depresso-emarginatis epunctatis, corolla pallide rosea tubo breviore.

Herba parva, acaulis, succulenta, dense caespitosa, ubique glabra, aphylla. *Folia* in corpuscula globosa, apice convexa, 1–1·3 cm. diametro fusa, glauco-viridia (haud glauca), emaculata et epunctata, fissura centrali 3 mm. longa, nec depressa, sed tempore florentis in tuberculum parvulum elevata. *Pedunculus* exsertus, 3 mm. longus, compressus, 2–2·5 mm. latus, albidus. *Calyx* 4-lobus, albidus vel pallide albo-virens, apice pallide rubro-tinctus ; lobi 2–3 mm. longi, oblongi vel ovati, obtusi, membranaceo-marginati. *Corolla* gamopetala, 1·8–2 cm. diametro, subinfundibuliformis, pallide rosea, albo-oculata ; tubus 5 mm. longus ; petala 40–55, circiter 3–4-seriata, exteriora 8–9 mm. longa, interiora 5 mm. longa, linearia, obtusa vel acuta, integra. *Stamina* vix exserta, 5–6-seriata, erecta, lutea. *Styli* 4, filiformes, erecti, 8–9 mm. longi, ad medium connati, apice lutei.

South Africa. Little Namaqualand : lower side of the northern aspect in River Valley, 3 miles west of Garies, *Pillans and Pearson*, 5582.

Described from a living plant sent to Kew by Prof. Pearson in 1911. The flowers of this species open in the morning and begin to close about 2 p.m. and are quite unaffected by sunshine or dull sunless weather. Each flower opens successively for 5–7 days.

1434. **Mesembryanthemum odoratum**, *N. E. Brown* [Ficoideae-Mesembryeae] ; affinis *M. ficiformi*, Haw., sed corpusculis punctis paucioribus et floribus multo majoribus odoratis differt.

Herba parva, acaulis, succulenta, aphylla, caespitosa, glabra. *Folia* in corpuscula obconico-obcordata, compressa, 2–3 cm. alta, ad 2·5 cm. lata fusa, glauco-viridia, punctis atroviridibus in lineas subbicruciatim dispositis notata. *Calyx* in pedunculo 2–3 mm. longo exsertus, compressus, 4-lobus ; tubus ad 4 mm. latus ; lobi 2·3–3 mm. longi, oblongi, obtusi, membranaceo-marginati. *Corolla* vesperem versus expansa, odoratissima, 1·8–2·5 cm. diametro, pulchre carneo-purpurea, nitida ; petala sub 80, subbiseriata, 0·8–1 cm. longa,

1 mm. lata, integra vel apice emarginata. *Stamina* vix exserta, albida. *Styli* 4, inclusi, staminibus multo breviores, lineares, obtusi.

South Africa. Worcester Division; mountains near Worcester, *Cooper*.

Described from a living plant, which has been in cultivation for over 40 years but never previously described. It was introduced in 1862 by Mr. Thomas Cooper, who informed me that he believed that he collected it at the above-mentioned locality. Its flowers open about 4 p.m. and are closed the next morning, but after opening and closing for 3 days, they do not close again, but remain expanded, with the petals spread over the top of the plant until they wither, each flower lasting altogether for 6 or 7 days. They are most delightfully scented, very much like cloves.

1435. **Mesembryanthemum evolutum**, *N. E. Brown* [Ficoideae-Mesembryeae]; species ab omnibus distinctissima.

Herba nana, succulenta, densissime caespitosa. *Plantulae* (vel rami) 2–4-foliatae, 6–7 mm. diametro. *Folia* erecta, basi connata, parte libera 2–3 mm. longa, semiglobosa, facie interiore plana, dorso valde convexa, marginibus ciliatis, viridia, emaculata. *Calyx* exsertus, 5-lobus, glaber; lobi 3–4 mm. longi, oblongo-lanceolati, obtusi, virides, basi purpureo-tincti. *Corolla* 16 mm. diametro; petala circiter 36, biseriata, 6–6·5 mm. longa, linearia, obtusa vel minute emarginata, roseo-purpurea, leviter nitida. *Stamina* numerosa, conniventia, exteriora filiformia, ananthera, inferne albida, superne atropurpurea. *Styli* 5 erecti, staminibus subaequilongi, subulati.

South Africa. Little Namaqualand, without precise locality, collected during the Percy Sladen Expedition to the Orange River by *Prof. Pearson*, no. 5946.

Described from a living plant, sent to Kew by Prof. Pearson, which flowered in October, 1912. This minute species is quite distinct from all others hitherto described, and connects those belonging to the group having two leaves fused into a small obconic body with those in which there are two or four free leaves.

1436. **Kalanchoe sexangularis**, *N. E. Brown* [Crassulaceae]; affinis *K. paniculatae*, Harv., sed caule sexangulari et cymis in paniculam superpositis distinctissima.

Herba succulenta, circa 1 m. alta. *Caulis* simplex, strictus, sexangularis, basi 1·3 cm. crassus, glaber, viridis. *Folia* opposita, petiolata, glabra, viridia, haud glauca; petiolus 1–2 cm. longus, 6–8 mm. latus, supra canaliculatus, subtus carinatus; lamina foliorum inferiorum 7–9 cm. longa, 5·5–8 cm. lata, elliptica vel suborbicularis, apice obtusissima vel rotundata, basi in petiolum brevissime et abruptissime cuneata, obscure vel distincte crenata, plana vel ad apicem convexa, marginibus reflexis, foliorum superiorum gradatim minora, angustiora, concava. *Cymae* pedunculatae, adscendentes, 3·5–5 cm. latae, in paniculam 20 cm. longam superpositae, glabrae, virides, haud glaucae; pedunculi 3–5 cm. longi. *Bracteae* 1–3 mm. longae, lanceolatae, acutae. *Pedicelli* 3·5–5 mm. longi. *Calyx* 3 mm. longus, fere ad basin 4-lobus; lobi ovati, acuti. *Corolla* parva, glabra, flava, basi viridis; tubus 1 cm. longus, elongato-conicus, 4-angularis; lobi 2·5 mm. longi, suborbiculares vel rotundato-ovati, apiculati. *Stamina* inclusa.

South Africa. Transvaal? Described from a living plant sent by *Mr. Thorncroft* to Cambridge Botanic Garden, and communicated to Kew by R. I. Lynch.

1437. **Ceropegia Ledgeri**, *N. E. Brown* [Asclepiadaceae - Ceropegieae]; affinis *C. vincaefoliae*, Hook., sed pedunculis glabris, corollae tubo purpureo et corona diversa facile distinguitur.

Herba volubilis. *Caulis* 2 mm. crassus, glaber. *Folia* glabra, pulchre olivaceo-viridia; petioli 2 cm. longi; lamina 4·5–6·5 cm. longa, 2·2–3·8 cm. lata, elongato-ovata, acuta, basi rotundata vel levissime subcordata, integra. *Pedunculi* axillares, solitarii, 1·6–2 cm. longi, 1·25 mm. crassi, umbellatim 3–4-flori. *Pedicelli* 1–1·5 cm. longi, glabri, purpureo-punctati. *Sepala* 4 mm. longa, subulata, acuta, glabra. *Corollae* tubus curvatus, 2·3 cm. longus, utrinque glaber, sed intra ad apicem inflationis annulo pilorum crispatorum alborum ornatus, basi ellipsoideus et 5 mm. diametro, intra pallidus, purpureo-maculatus, medio cylindricus et 2 mm. diametro, intra atro-purpureus, extra pallidus, apice infundibuliformis et 9 mm. diametro, fusco-purpureus, intra pallidus, minutissime fusco-purpureo-punctatus; lobi 1·1–1·2 cm. longi, erecti, apice leviter connati, glabri, marginibus in parte superiore pilis simplicibus atropurpureis ciliatis, superne atropurpurei, inferne pallidi, minutissime purpureo-punctati. *Corona exterior* 10-dentata, glabra; dentes 1·25 mm. longi, erecti, lineari-subulati, purpureo-punctati. *Coronae interioris* lobi 2 mm. longi, arcte conniventes, erecti, lineares, glabri, purpurascentes.

The origin of this plant is unknown. It was purchased by Mr. Walter Ledger, of Wimbledon, some years ago, from Mr. W. Bull, under the name of *C. Gardneri*, from which species it is entirely different. But as it bore that name, it probably is a native of the same region and doubtless was introduced from some part of India or the Malay Archipelago. Mr. Ledger has assiduously collected and cultivated the species of this interesting genus for many years.

1438. **Caralluma Burchardii**, *N. E. Brown* [Asclepiadaceae-Stapelieae]; affinis *C. europaeae*, N. E. Br., sed corollae lobis immaculatis intra pilis albis dense obtectis differt.

Caules succulenti, erecti, ramosi, 7–50 cm. longi, 1·5–2 cm. crassi, subacute tetragoni, angulis dentatis; dentes (folia rudimentaria) 1 mm. prominentes, deflexi, late deltoidei. *Flores* prope apicem caulorum fasciculati, sessiles. *Sepala* 3 mm. longa, lanceolata, acuta, glabra. *Corolla* rotata, 1·3 cm. diametro, intra alba, immaculata, pilosa, extra olivaceo-brunnea (ex *Burchard*); lobi 4 mm. longi, 3·5 mm. lati, ovati, acuti. *Corona* exterior cupuliformis, 10-dentata, lutea; dentes 1 mm. longi, erecti, subulati; interior 5-loba, lutea; lobi 1–1·25 mm. longi, antheris incumbentes et eas aequantes, lineares, obtusi. *Folliculi* 7–8 cm. longi, 7–8 mm. crassi, teretes, acuti, glabri, purpureo-vittati. *Semina* 6 mm. longa, 3·5 mm. lata, oblongo-obovata, plana, late marginata, glabra, pallide brunnea.

Canaries. Common on recent lava streams, tops of volcanoes and on clay in the whole of the northern part of the island of Fuerteventura, but not yet found in the Handia Mountains, *Dr. O. Burchard.*

This is closely allied to *C. europaea*, N. E. Br., and *C. maroccana*, N. E. Br., differing in its unspotted flowers, which are covered with white hairs inside, and also in its corona. It is an interesting discovery, as it is the first record of this genus in the Canary Islands. Living plants and flowering specimens in formalin have been kindly sent by Dr. Burchard to the Royal Botanic Gardens, Kew.

1439. **Euphorbia Eustacei**, *N. E. Brown* [Euphorbiaceae-Euphorbieae]; species ab omnibus habitu et spinis longis albis distinctissima.

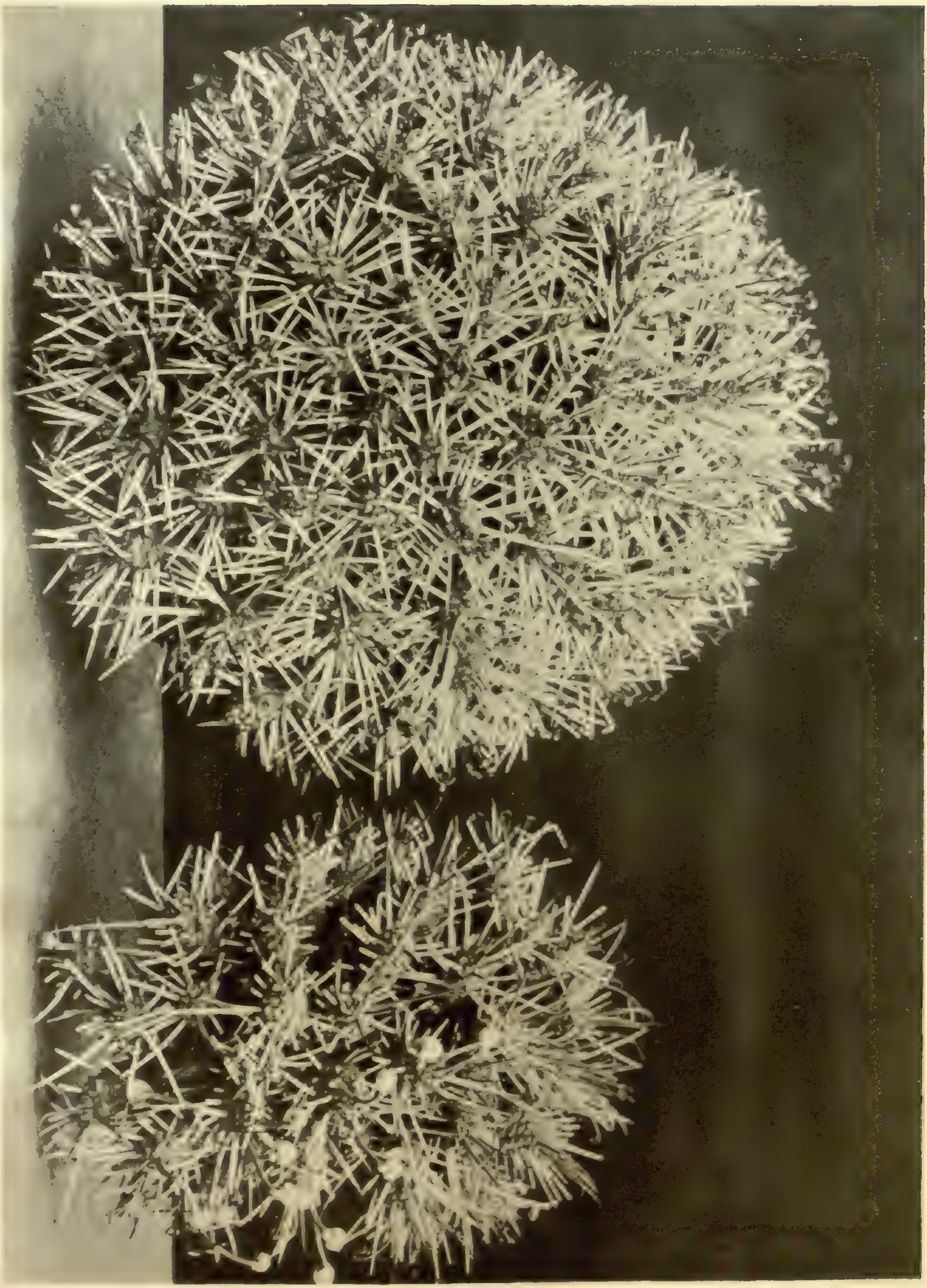
Planta succulenta, spinosissima, hemispherico-caespitosa, 10–15 cm. alta, 20–30 cm. diametro, dioica. *Rami* conferti, 4–11·5 cm. longi, 1·7–2 cm. crassi, cylindrici, vix tuberculati, sed lineis impressis areolas hexagonas circumdantibus notati, glabri, pallide virides. *Folia* petiolata, 2–3·2 cm. longa, 5–7 mm. lata, oblanceolata, obtusa vel subacuta, mucronata, e medio in petiolum 4–6 mm. longum attenuata, minutissime puberula, decidua. *Spini* solitarii, patuli, 2–5 cm. longi, albi, glabri. *Pedunculi* solitarii, 2–3 cm. longi, apice bracteis 3–4 verticillatis inferne bracteis 2–3 sparsis instructi. *Bracteae* superiores 3–5 mm. longae, 2–3·5 mm. latae; oblongae vel obovato-oblongae, inferiores minores. *Involucrum* 4–6 mm. diametro, subcampanulatum, glabrum vel minutissime puberulum; glandulae 1·5–2·5 mm. latae, cuneato subrectangulares, integrae. *Ovarium* subsessile, minutissime velutino-puberulum; styli inferne in columnam 1·5 mm. longam connati, superne in ramos 1·3 mm. longos patulos apice bifidos divisi. *Capsula* brevissime pedicillata, 6 mm. diametro, depresso-globosa, minutissime velutina. *Semina* 3 mm. longa, ovoidea, obscure et minute rugulosa, cinerea.

South Africa. Laingsburg Division: near Matjesfontein, *E. Pillans*.

The above description and accompanying figures are made from living male and female plants sent to the Royal Botanic Gardens, Kew, by Mr. Eustace Pillans of Cape Town, to whom and to his son, Mr. Neville S. Pillans, Kew is also indebted for a large number of other interesting plants; their services are commemorated by naming this and the following very distinct species after them. The figures of *E. Eustacei* represent the plants as seen from above, the pots containing them being laid upon their sides. The larger figure is that of the male and the smaller that of the female plant. Viewed from the side, the plants have the form of hemispherical spiny cushions, the larger of which is about one foot in diameter. The stems are pale green at the younger parts and the spines very white, so that the contrast is rather pleasing, and the whole appearance of the plant is entirely distinct from any other species in cultivation.

1440. **Euphorbia Pillansii**, *N. E. Brown* [Euphorbiaceae-Euphorbieae]; affinis *E. stellaespinae*, Haw., sed caule transverse zonato-variegato, angulis paucioribus, spinis validioribus et involucro majore differt.

Planta succulenta, 10–15 cm. alta, basi ramosa, aphylla, spinosa, glabra, dioica. *Caules* vel rami 3–5 cm. crassi, obtusissime 7-angulati, zonis alternis viridibus et atroviridibus transverse notatis,



EUPHORBIA EUSTACEI.

[*To face page* 122.

EUPHORBIA PILLANSII.

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angulis crenatis. *Folia* rudimentaria 1 mm. longa, deltoidea, acuta, decidua. *Spini* solitarii, apice stellato-ramosi vel simplices, 8–17 mm. longi, 1·5–2 mm. crassi, glabri, cinerei. *Pedunculi* erecti, 7–12 mm. longi, 1–2·5 mm. crassi, umbellatim 2–6-flori vel interdum uniflori, minute bracteati. *Pedicelli* 5–6 mm. longi, apice bibracteati. *Bracteae* 2–3 mm. longae et latae, subquadratae, apiculatae, glabrae. *Involucrum* 5–6 mm. diametro, late campanulatum, glabrum, viride, glandulis 5 transverse ellipticis vel sub-reniformibus integris atro-viridibus. *Ovarium* non vidi.

South Africa. Ladismith Div.: near Doornkloof River, between Muis Kraal and Ladismith, *N. S. Pillans*.

The description and figure of this species are made from a living plant sent by Mr. Neville S. Pillans to the Royal Botanic Gardens, Kew, where it flowered in Dec., 1912. *E. Pillansii* is allied to *E. stellaespina*, Haw., but is well distinguished from that species by its much fewer angles, stouter spines, and the transverse pale greenish bars upon its stems. The figure represents the plant of its natural size.

XVIII.—CASCARA SAGRADA.

(*Rhamnus Purshiana*, DC.)

W. J. Bean.

Attention has already been called in these pages to the possibility of this drug proving a remunerative culture in the British Isles (see *K. B.* 1908 p. 429) and the question has aroused considerable interest in various parts of the country. In 1908, seeds of *Rhamnus Purshiana* were distributed from Kew to about twenty establishments in England, Scotland and Ireland. Reports have just been received from most of the recipients as to the germination of the seeds, also notes on the behaviour of the plants. The seeds as received from America do not appear to have had a high germinating power, and even the most successful results do not show that more than 35 per cent. were fertile. The seeds appear to have germinated best when the stiff pulp (the dried fruit) in which the seeds, as received, are embedded is removed before sowing. The most successful results both as to germination and growth have been obtained in the garden of Mr. Collis-Sandes at Oak Park, Tralee, Ireland, where some of the plants raised from the 1908 seed are already 9 feet high, 8 feet in diameter, and 6 inches in girth of stem. At Fota they are 7 feet, at Rossdohan 8 feet, and at Glasnevin 6 feet high. The tree is also succeeding particularly well in the south-west of Scotland with Sir Herbert Maxwell, who had six plants from Kew in 1908. Plants at the Edinburgh Botanic Garden are thriving well.

The species, like our native *R. Frangula*, is capable, evidently, of very soon arriving at the fruiting stage, for Sir Herbert Maxwell's plants bore a plentiful crop of berries in 1911, and although his plants are two or three years older than the plants raised from seed in 1908, they show that, in favourable circumstances, trees five or six years old will produce fruit. It appears

probable, therefore, that once the tree becomes established its propagation will offer no difficulties. It is pretty certain that seeds sown directly from the tree will give a higher percentage of germination than those that have been kept an indefinite time in seed-rooms. Sir Herbert Maxwell did not save his seed, but that gathered from older trees at Kew has germinated well.

This Rhamnus seems to prefer a light to a heavy soil, and wherever it has been tested, has made the best growth in the former. In the cold district of Aldenham House, Elstree, Herts, Mr. Vicary Gibbs reports that the plants raised from the 1908 seed, although very healthy, are only 2 feet high planted in heavy soil; and at Woburn, Mr. Spencer Pickering reports that in a light soil the plants have done much better than in a heavy one, some of last year's growths in the former being 3 feet long. At Colesborne, in Gloucestershire a cold limestone district, Mr. H. J. Elwes informs us that the 1908 plants are quite hardy and healthy, but grow slowly—about 2 feet only in three years.

Of the hardiness of the species in the greater part of the British Isles, there is, we believe, no doubt. At Kew, the trees raised from seed in 1891 withstood the great frosts of February, 1895, without being in the least affected, although the minimum temperature for a few nights ranged between 1° and 6° Fahr.

In connection with the possibility of establishing plantations of *R. Purshiana*, attention may again be called to the fact that it has been found possible at Kew to strike cuttings by taking them in July. The cuttings should be of the new shoots 3–4 inches long with a "heel" of older wood at the base (see *K. B.*, 1912, p. 393).

As already indicated in the *Kew Bulletin* (1908, p. 429), the bark collected from the trees at Kew has been shown to possess medicinal properties indistinguishable from those of American Cascara. It has been suggested to us that it by no means follows that the bark of trees grown in the damp, less sunny parts of the British Isles will be equal in quality to the Kew product—the Thames Valley being one of the sunniest and driest districts in the Kingdom. This, of course, is a matter for experiment.

At the prices at present obtainable for Cascara Sagrada, it scarcely seems likely that it would prove a paying crop. In Bulletin No. 139, p. 40, issued by the Bureau of Plant Industry, United States Department of Agriculture, it is stated that one tree is estimated to yield approximately 10 lbs. of bark. As the price then (in 1908) paid to collectors for the bark was 3 to 4½ cents. per lb., it follows that the produce of one tree barely amounted to two shillings. At this price the cultivation of the tree cannot be remunerative, especially if a system of collecting the bark is adopted (as in America) that proves fatal to the tree.

The bark of the tree grown at Kew proved very difficult to remove, and had to be scraped or cut off rather than peeled, but this was done in February. The collecting season in America, which opens about the end of May or early in June and closes about the end of August, covers the period of the greatest flow of sap. The bark evidently comes away easily enough then, as it is brought to market in "quills" or rolls.

Another factor to be taken into consideration is that Cascara bark should be at least one year gathered before it is used.

There is every probability that the price of this drug will rise considerably. In 1908 the world's consumption was said to be two millions of pounds annually, which means that 200,000 trees would have to be destroyed yearly to maintain the supply. As no steps are being taken in America to renew the trees, it is evident that the natural supplies must fail within a limited time. As Cascara Sagrada is a most valuable laxative with unique properties, it appears likely that the demand for it would continue with greatly enhanced prices.

An interesting question is whether some means of utilising the younger parts of the tree, say the one- or two-year-old shoots, can be devised, which would leave the tree as a whole uninjured. The year-old bark is said to be equal in medicinal value to that on older wood, and if the tree were grown in plantations whence an annual crop of branchlets could be taken, its cultivation and utilisation would be much simplified and cheapened.

XIX.—MISCELLANEOUS NOTES.

Mr. A. H. Kirby, B.A., Scientific Assistant, Imperial Department of Agriculture for the West Indies, has been appointed by the Secretary of State for the Colonies, Assistant Director of Agriculture in Southern Nigeria.

Mr. F. W. South, B.A., Mycologist and Agricultural Lecturer, Imperial Department of Agriculture for the West Indies, has been appointed by the Secretary of State for the Colonies, Chief Agricultural Inspector, Federated Malay States.

Mr. T. D. Maitland, Curator in the Agricultural Department, Southern Nigeria (*K. B.* 1910, p. 64), has been appointed by the Secretary of State for the Colonies a District Agricultural Officer in the Uganda Protectorate.

Larix occidentalis.—It may be of interest to put on record for future reference the making of a plantation of this larch in the grounds of Queen's Cottage at Kew. In February, 1909, a parcel of seed was presented to Kew by Mr. A. Henry. The seeds germinated well, and about 600 plants were raised in the Arboretum nursery. Having reached a size at which it became necessary to find permanent quarters for them, it was decided to make a plantation in the Queen's Cottage Grounds, where one of the clumps of miscellaneous trees was cleared away for the purpose. Some 400 trees were put out on March 12th and 13th, 1913, on a piece of ground one-third of an acre in extent, which enabled the young trees to be set out about 6 feet apart. Except for a liability to be injured by late spring frosts, which causes a number of "leaders" to form instead of one, these young larches are succeeding well at

Kew. During the summer of 1912, most of the plants made leading growths 15 to 18 inches long, some of them 24 to 28 inches. The susceptibility to spring frosts is likely to be greater in a flat, low-lying situation like Kew, which is scarcely above the level of high tides, than in elevated ones; nor are the frosts so likely to affect plants above 6 feet in height. The old trees in the pinetum at Kew, which are the finest in the country at the present time, show no signs of having been checked by frost, the stems being straight and the tallest now 41 feet high.

Larix occidentalis is undoubtedly the finest of all larches. Sargent gives its maximum height as 250 feet, and Mr. Elwes mentions a tree in Montana said to have been 233 feet high and 24 feet in girth near the ground. But from personal observation, neither Elwes nor Henry seem to have found trees larger than 180 feet in height with a trunk girthing 15 feet at 5 feet from the ground. It is much to be hoped that so magnificent a tree will succeed generally in the British Isles. The old trees at Kew are planted in some of the driest and sandiest ground on the place; the new plantation, however, is on soil of a more loamy nature. I recently saw in the new Forestry Station founded by the Department of Agriculture in Ireland at Avondale, co. Wicklow, a plantation that had been made of about 1000 trees. Mr. A. C. Forbes was not pleased with their progress; certainly it did not compare with that of common or Japanese larch, but at Avondale the young plantations have to get away from a thick mat of grass, and it is possible that when (or if) they are able to overtop and subdue this, they may show better results.

W. J. B.

Storm on Easter Eve.—A storm of unusual violence passed over Kew and the South of England generally on the evening of Saturday, March 22nd. It commenced suddenly between 7 and 8 p.m. and ceased as abruptly soon after midnight; at its height the wind is said to have attained a velocity of 70 to 80 miles an hour. A few losses have to be recorded. The single specimen Kew possessed of the true pitch pine (*Pinus palustris*) had its top broken off. This tree was about 13 feet high and consisted of one stem about 3 inches thick bearing a few tufts of leaves near the top. It was a mere caricature of what the pitch pine really is, and had to be supported by stakes and wires, but Messrs. Elwes and Henry do not seem to have found a better in the British Isles.

The last tree was also uprooted of the well-known group of very picturesque Weymouth pines (*Pinus Strobus*), which stood in the Rhododendron Dell on the left-hand side of the entrance to the Bamboo Garden. This group of pines, originally four in number, was much beloved of artists; their ivy-clad trunks and gaunt limbs must figure in many hundreds of pictures of various kinds. On this account they were left as long as possible, but one of them was blown down in a storm about three years since and two others had since become so insecure that they were taken down also.

The oldest and largest *Crataegus nigra* in Kew, growing in the Thorn Avenue, was rent in two, and one of the curious circular group of beeches, near the Lily Pond, was snapped off midway up the trunk.

Oil-seeds.—During the past few years there has been considerable activity in the oil crushing industry and many oil-seeds have been submitted to Kew for determination by those interested in the trade. There is a demand for seeds that will yield edible fatty oil with a marc that may be employed as a cattle food.

Samples of the following seeds unfamiliar to the English market as oil-seeds have recently made their appearance, and it may be well in recording the fact to add a few details as to their known properties and applications :—

Lucuma mammosa [*Sapotaceae*] Mammee Sapote. A tree of Tropical America often cultivated in the West Indies for its fruit, which is of a rusty-brown colour, containing an agreeably flavoured pulp, bearing some resemblance to quince marmalade. The seed is polished, with a large scar, and the kernel, which contains hydrocyanic acid, is used in the West Indies for flavouring, as a substitute for bitter almonds.

Vigna Catiang [*Leguminosae*]. The Cow Pea, Chowlee (India), Tow Cok (China). An annual, widely cultivated in the tropical zone for its seeds, which are used as food. The green pods, especially of a long-podded form, are plucked while young and eaten as a vegetable. The stalks and leaves are said to be employed in the preparation of a green dye. A sample of seeds determined as a variety of this species have recently been received from Roumania as "oil-seeds," but according to Church in "Food Grains of India," they contain under two per cent. of oil.

Afzelia quanzensis [*Leguminosae*]. A large forest tree of Tropical Africa. The seeds, which are black with a scarlet aril, are used as charms, for the heads of hat-pins, and for necklaces.

Parkia biglobosa [*Leguminosae*]. Nété, Nitta, or Nutta, African Locust, Café de Soudan. A tree of 40 to 50 feet in height, native of Tropical Africa, with pods 8 to 12 inches long. The seeds are compressed, involved in fleshy, at length dry and mealy pulp, which is used as food, and the parched seeds are employed as coffee in the preparation of a beverage. [See *Kew Bulletin*, Add. Ser. ix., pt. ii., p. 281.]

Pongamia glabra [*Leguminosae*]. A moderate-sized almost evergreen tree of the tidal and beach forests and along tidal river banks all round India, Burma and Ceylon. Also along streams and rivers in the forests of South and Central India extending northwards to the Himalaya and eastwards to the Shan Hills of Burma. Much cultivated. The seeds are reniform, compressed, almost round, smooth and of a grey colour. They are used in native medicine and also yield a thick red-brown oil used for burning, but is not popular for the purpose on account of its offensive odour. It is employed in medicine for outward application in skin diseases, for rheumatism, and to destroy worms in sores.

Semecarpus Anacardium [*Anacardiaceae*]. The Marking Nut tree of India. The fruits consist of an oblong oblique drupe with a thick black pericarp, between the layers of which are the cells containing the corrosive juice which forms the marking ink extensively employed in India to give a black colour to cotton fabrics. The drupe is seated on a yellow astringent hypocarp, which is sometimes eaten, usually either dry or roasted. The kernels contain a small

quantity of sweet oil; the pericarp contains 32 per cent. of a vesicating oil of specific gravity 0·991, easily soluble in ether, and blackening on exposure to the air.

Hydnocarpus venenata [*Bixineae*]. A large tree found by the banks of rivers in Ceylon up to 2000 feet. The seeds are rough, with grooved ridges, and yield an oil of the consistency of ordinary hard salt butter, which is known in Kanara as "Thortay" oil, used in the treatment of skin diseases, leprosy, &c. If eaten, these seeds produce giddiness, and are employed by the natives as a fish poison. Their poisonous properties, however, are so strong that fish, thus killed, are unfit for food. The fruits are also used as a fish poison.

Mesua ferrea [*Guttiferae*]. Ironwood or Nagkesur of Assam, described as a beautiful tree bearing large Cistus-like white flowers, called in Sanskrit "Kanjalkama" and "Nágkesara," and a favourite of the Indian poets. The seeds are of a dark brown colour with a smooth testa, in form and colour resembling chestnuts. The kernels yield 72·9 per cent. of a deep brown or yellow oil, very bitter, which deposits white crystalline fats at ordinary temperatures. In India the oil is employed for burning in lamps, as a healing application to sores, and as an embrocation in the treatment of rheumatism. In Ceylon, where the tree is known as "Na," the oil is used for various diseases in cattle and also against rheumatism. The oil-cake contains 24·16 per cent. of protein.

J. M. H.

Bamboos for Paper-making.*—The four species of Bamboos examined with regard to their suitability for paper-making were *Bambusa arundinacea*, *Bambusa polymorpha*, *Cephalostachyum pergracile* and *Melocanna bambusoides*. The area over which the examination took place was restricted to Lower Burma and the West Coast of the Indian Peninsula as both these localities are geographically well suited for import and export purposes and contain vast areas covered with bamboos. Five areas in Burma and six on the West Coast of India were examined and figures as to yield, etc., were very carefully collected. In order to obtain practical proof of the quality and cost of preparing pulp from bamboos about 80 tons of raw material of the four different species were converted into pulp and eventually into paper at the Tita Shur Paper Mills, Calcutta.

It should be mentioned that the Report is printed on paper made from *Bambusa polymorpha* and that both nodes and internodes were used.

The Report is divided into six parts.

In Part I an interesting historical account of former enquiries as to the value of bamboos for paper-making is given and the general conditions necessary for the successful establishment of a paper-pulp mill are detailed.

Part II deals with the mode of growth and possible out-turn of bamboos. The most useful species appears to be *B. polymorpha*.

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* "Note on the utilization of Bamboo for the Manufacture of Paper-pulp," by R. S. Pearson, I.F.S. The Indian Forest Records, vol. iv, part v. January, 1913. 109 pp. with appendices, maps and photographs.

It is smaller than *B. arundinacea* which is difficult to work with owing to the weight of the culms and the hardness of the nodes. *Cephalostachyum pergracile* is smaller than *B. polymorpha* and not quite so common, but otherwise is considered quite as suitable for paper-pulp. *Melocanna bambusoides* has not so far been found so favourable since a seven years' rotation for cutting has to be allowed for as against a five years' rotation for the other species. Moreover, the paper-pulp made from *M. bambusoides* would not bleach with a reasonable quantity of bleaching powder and black stringy fibres from the sheath also spoilt the quality of the paper. These, however, can easily be removed and it may be found after further testing that a good paper-pulp can be made from this plant. The rate of growth of the different species and the effect of felling is very carefully considered and the cost of extraction and the out-turn for various localities is given in detail.

In Part III the cost of manufacturing the paper-pulp is dealt with and the necessary treatment of the stems is described. Then follow the reports on the pulp made from the four species with figures as to cost.

Part IV (pp. 40–104) occupies the larger portion of the Report and deals in detail with the various bamboo areas in Burma and India and also considers the possible sites for paper-pulp mills. This part is further illustrated by the maps. A great deal of information as to the mode of growth of the bamboos, cost of cutting and extraction, lines of export, labour, etc., is given here, of too special a character for a brief review, but invaluable in connection with the possible establishment of a definite bamboo paper-pulp industry.

In Part V the cost of plant required for a pulp-mill is considered, and in Part VI reference is made to the chemicals necessary for the industry and figures as to their cost, etc., are given.

The Report, which is of an exhaustive nature, affords very valuable data for estimating the probability of the success of establishing a paper-pulp industry in Burma and India.

Prices of English Timber.—Prospective work which is to be carried out by the Metropolitan Water Board on the Littleton Park Estate, Staines, necessitated the disposal of the whole of the timber growing on an area of 600 acres, which was sold by auction on February 12th. The sale was particularly interesting, for it gave a good idea of the average value of the general timber growing in plantations, parks and hedgerows on well-placed estates. The volume of timber ran to approximately 111,000 cubic feet and consisted of oak, ash, elm, horse chestnut, sweet chestnut, plane, Scots pine, larch, spruce, beech, &c., the first three kinds predominating. It may be said to be typical of the timber found on many estates throughout the country, some, more particularly the ash, being of good quality, others being medium, and a fair percentage medium to poor; amongst the latter being aged, rough or immature trees. By a comparison of maximum and minimum prices a good indication is given of the difference in quality of the various lots. The estate is favourably situated for the removal of timber, for it is within

one mile of one railway station, two miles of two others, is near a river wharf and is but 15 miles from London. Moreover, nine months are allowed for the removal of the timber, and facilities are granted for its partial working on the ground. Oak ran to about 54,000 feet and consisted of all classes of trees, from well-grown clean specimens containing between 60 and 110 feet of timber, to rough hedgerow trees of 20 to 40 feet, and a considerable number of small trees containing less than 20 feet each. About 18,639 cubic feet of ash realised the best prices of the sale, and the general quality was more consistent than that of other kinds. Of 24,378 feet of elm offered, a good deal was small and prices generally were low. Horse chestnut was in demand and sold well, and the same may be said of plane. About 1500 feet of beech in several lots created little excitement, and neither lot secured a good price. Larch, spruce and Scots pine together were estimated to yield 4319 feet, and all was knocked down below the average price. In a few cases the trees had been felled, but this fact did not appear to affect the prices to any appreciable extent.

Taking the sale throughout the timber averaged about 11*d.* a cubic foot, omitting fractions, and the prices of individual kinds per cubic foot are given below. In each case small fractions are omitted :—

Variety of Timber.	Average Price.	Maximum Price.	Minimum Price.	Remarks.
Oak	10¾*d.*	1*s.* 11¼*d.*	4¼*d.*	Young and rough trees seriously affected the average price.
Ash	1*s.* 9*d.*	3*s.*	11¾*d.*	Although the maximum price only once exceeded 2*s.* 5*d.*, it only dropped below 1*s.* twice.
Elm	5¾*d.*	10¼*d.*	2¼*d.*	There was a considerable amount of small timber.
Horse chestnut ...	1*s.* 2¾*d.*	1*s.* 11*d.*	1*s.* 0¼*d.*	Appeared to be in good demand.
Plane	1*s.* 1¼*d.*	1*s.* 4*d.*	1*s.*	A few buyers were eager to purchase.
Sweet chestnut ...	8*d.*	1*s.* 3½*d.*	7*d.*	—
Beech	7½*d.*	1*s.* 0¾*d.*	4½*d.*	—
Scots pine, spruce and larch	2¾*d.*	9¼*d.*	1¾*d.*	The highest price was obtained for one lot composed chiefly of larch.

W. D.

Balanites Dawei, Sprague.

Balanites Maughamii, Sprague.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 4.] [1913.

XX.—MANDURO: A NEW OIL-YIELDING TREE FROM PORTUGUESE EAST AFRICA.

(*Balanites Maughamii*, Sprague.)

T. A. Sprague.

In November, 1911, leafy branches of a species of *Balanites* (Simarubaceae*) were received at Kew from Mr. R. C. F. Maugham, H.M. Consul at Lourenço Marques, accompanied by a letter from which the following paragraphs are extracted.

"I beg to enclose under separate cover some twigs and foliage of a tree growing in some profusion in this district, which, it has been found, produces a fruit the kernel of which is highly oleaginous, and yields not less than 60 per cent. of a fine oil perfectly suitable for alimentary, lubricating or manufacturing purposes."

"I regret I have no nuts remaining, but I have sent small quantities both to the Imperial Institute and the Commercial Intelligence Department of the Board of Trade."

The material received from Mr. Maugham was identified as an undescribed species of *Balanites* agreeing with a specimen in the Kew Herbarium collected at the Rovuma River by Dr. (now Sir John) Kirk, and mentioned by Oliver, Fl. Trop. Afr. vol. i. p. 315, under *Balanites aegyptiaca*, as possibly belonging to a distinct species.

The following additional information regarding the tree was contained in an official report dated 25th Oct., 1911, from Mr. Maugham, a copy of which was transmitted to Kew.

"A discovery of some value has been recently made in this district by a Portuguese gentleman named Ferreira Leao. This discovery takes the form of a large hitherto unidentified tree growing plentifully, it is said, in the neighbouring Lebombo Mountains, and elsewhere near at hand. The growth in question produces a nut or

* Some botanists have referred the genus to the Zygophyllaceae, whilst others have made it the type of a special family, the Balanitaceae or Agialidaceae.

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almond which contains some 60 per cent. of clear oil similar to finest olive oil and burning with a bright flame.

"No intelligible name can be given to the tree in question, which is described as reaching a height of from 45 to 60 feet and producing annually an average of 1,200 lbs.* of nuts. It yields after four years and grows rapidly even in dry sandy soil."

Specimens of the fruits were received subsequently at Kew from the Commercial Intelligence Branch of the Board of Trade and the Imperial Institute, with the information that the tree bearing them grew in large numbers in the Lebombo Mountains and on the banks of the Umbeluzi River.

The new *Balanites* could be distinguished from all previously described species except *B. Wilsoniana*, Dawe & Sprague, by bearing curious forked spines, and from *B. Wilsoniana* by its much smaller fruits.

In the absence of flowers, an adequate technical description could not be drawn up, and Mr. Maugham was accordingly requested to procure flowering specimens of the tree, if possible. Shortly afterwards, however, good flowering material, together with fruits and a barren shoot, was received from Mr. M. T. Dawe, Director of Agriculture, Companhia de Moçambique, Beira; and a full description of the species is given below under the name *Balanites Maughamii*. Mr. Dawe sent at the same time specimens of a second new species, closely allied to *B. Maughamii*, but differing in the shape of the petals and the elongated fruits. For this the name *B. Dawei* is proposed.

History of the Genus Balanites.

In order that the relationships of the two proposed new species may be understood, it will be necessary to give some account of those previously described.

The first species known was *Balanites aegyptiaca*, which has been cultivated in Egypt for more than four thousand years. Stones of *B. aegyptiaca* have been found in tombs of the twelfth dynasty. These were placed there as votive offerings, the edible pulp having previously been removed. Schweinfurth states that the ancient Egyptians frequently offered to the dead merely the stones of fruits of which they had already eaten the edible part. (Ber. Deutsch. Bot. Ges. vol. ii. 1884, p. 362; Egyptian Gazette, Jan. 31, 1884.)

B. aegyptiaca was described and figured in 1592 by Prosper Alpinus, under the name Agihalid (De Pl. Aegypt. Liber, p. 16). The leaves and spines are evidently intended for those of *B. aegyptiaca*, but the flowers and fruits belong to a species of *Lycium*. The name 'Agihalid' is a corruption of the Arabic 'Heglig' (Delile, Fl. d'Égypte, p. 77).

Linnaeus included Agihalid in the genus *Ximenia* as a second species, *X. aegyptiaca*, differing from *X. americana* in having 'geminate leaves' (Sp. Pl. 1753, p. 1194).

Adanson recognized that Agihalid was generically distinct from *Ximenia*, and proposed the new genus *Agialid* to accommodate it (Fam. Pl. 1763, vol. ii. p. 508). He was the first to publish a correct

* This amount was subsequently corrected to 40–50 lbs. of nuts (Dipl. and Cons. Rep., Ann. Ser., No. 4881, 1912, p. 7).

description of the fruit of *Balanites* (*Agialid*), and there can be little doubt that his description was drawn up from a specimen which he himself had collected in Senegal in 1750, and identified with Agihalid of Prosper Alpinus. This specimen is the type of *Agialida senegalensis*, Van Tiegh. (Ann. Sc. Nat. ser. 9, vol. iv. p. 232).

Though *Agialid*, Adans., is the earliest name for the genus under consideration, it does not seem to have been adopted by other botanists until 1891, when Kuntze revived it in the modified form *Agialida* (Rev. Gen. vol. i. p. 103). The name *Agialid* was used by Hiern in 1896 (Cat. Welw. Afr. Pl. vol. i. p. 119) and the form *Agialida* by Van Tieghem in 1906 (Ann. Sc. Nat. ser. 9, vol. iv. p. 223). Most botanists, however, prefer to adopt the later generic name *Balanites*, which was accompanied by an excellent description and figure, and has now been in use for a century (Rep. Bot. Congr. Vienna, 1905, p. 245).

The genus *Balanites* was founded in 1813 by Delile on *Ximenia aegyptiaca*, Linn. (Fl. d'Égypte, p. 77, t. 28.) Delile evidently did not consider Adanson's generic name valid, as he quoted it in synonymy. His generic and specific descriptions are very accurate, and are followed by a valuable historical account of *B. aegyptiaca*.

An early description of *B. aegyptiaca* may be mentioned here. In 1704 a botanist named Augustin Lippi, to whom the genus *Lippia* was dedicated, travelled in Egypt, and his results were recorded in a manuscript volume entitled 'Description des plantes observées en Égypte par M. Lippi en 1704' (Pritzel, Thesaurus, ed. 2, p. 193). This work, which was never published, included a description of *B. aegyptiaca* from which the following particulars were extracted by A. L. de Jussieu in 1804 (Dict. Sc. Nat. vol. i. p. 297).

"Les fleurs . . . ont selon Lippi, un calice á cinq divisions profondes, cinq pétales, dix étamines, un germe supérieur surmonté d'une style et d'une stigmate, une baie contenant une noix pentagone et monosperme. Son fruit est purgatif, au rapport de Lippi qui ajoute que cet arbre n'est abondant que dans le royaume de Sennaar."

Balanites aegyptiaca is confined to Tropical Africa, Arabia, Egypt and Palestine.

A second species of *Balanites* was described in 1854 by Planchon, who pointed out that the Indian plant described by Roxburgh under the name *Ximenia aegyptiaca* (Fl. Ind. ed. Carey, vol. ii. p. 253) differed from the African in the petals being villous on the upper surface; and he accordingly regarded it as a new species, *B. Roxburghii* (Ann. Sc. Nat. ser. 4, vol. ii. p. 258).

In 1868 Oliver described a new variety of *B. aegyptiaca* from Angola, under the name var. *angolensis*, Welw. He remarked that "the fruit of this variety differs so remarkably from that of the ordinary form, that this plant may probably be specifically distinct."

A. W. Bennett in 1875 kept *B. Roxburghii* separate from *B. aegyptiaca*, but remarked that it was very nearly allied to, and perhaps only a variety of that species (Fl. Brit. Ind. vol. i. p. 522).

In 1896 Engler recognised only a single species of *Balanites*, extending from Senegambia to Burma (Engler & Prantl, Nat. Pflanzenfam. vol. iii. 4, p. 355).

In 1906 Van Tieghem, on the other hand, divided *Balanites* into 3 genera, comprising altogether 22 species. The three genera were *Agialida*, founded on *Ximenia aegyptiaca*; *Agiella*, founded on *Balanites aegyptiaca* var. *angolensis*; and *Balanites*, which Van Tieghem restricted to *B. Roxburghii* and its allies, although the type species of Delile's genus *Balanites* was *B. aegyptiaca*. The three genera were distinguished as follows:—

Petals glabrous on their upper surface:—	
Ovary hairy	*Agialida.*
Ovary glabrous	*Agiella.*
Petals hairy on their upper surface	*Balanites.*

Revision of the series Roxburghianae.

In the writer's opinion the characters mentioned are hardly of sufficient importance to justify the creation of new genera, but there can be no question that they are extremely useful for distinguishing groups of species. It is therefore proposed to recognize three series of species in *Balanites*, corresponding to Van Tieghem's three genera. Van Tieghem's generic names are unfortunately inapplicable, as two of them, according to the view here adopted, apply to the whole genus. The series are therefore named in each case after the type species; *Aegyptiacae* corresponding to *Agialida*; *Angolenses* to *Agiella*; and *Roxburghianae* to *Balanites*. The three groups have been styled 'series' instead of 'sections,' as it is doubtful in the present state of our knowledge whether they constitute natural groups.

The present investigation may be limited to the series *Roxburghianae*, as both *B. Maughamii* and *B. Dawei* have petals hairy on the upper surface, and are therefore assignable to that group. The previously described species belonging to the *Roxburghianae* are: *B. Roxburghii*, Planch., *B. Jacquemonti*, Van Tiegh., *B. indica*, Van Tiegh., *B. triflora*, Van Tiegh., *B. Wilsoniana*, Dawe & Sprague, and *B. Tieghemi*, A. Chevalier.

Balanites Jacquemonti, Van Tiegh., and *B. indica*, Van Tiegh., appear to be reducible to *B. Roxburghii*, Planch., the distinguishing characters mentioned by Van Tieghem being such as might be met with on branches of different age and at different seasons of the year. To give a single example, the leaves of *B. Roxburghii* described by Van Tieghem are old leaves of the spiny long-shoots; those of *B. Jacquemonti* are young leaves of the short-shoots; whilst those of *B. indica* are old leaves of the short-shoots.

Balanites triflora, Van Tiegh., appears, however, to differ specifically from *B. Roxburghii*, although the character of the three-flowered cymes given by the author does not hold good. In *B. Roxburghii* the spines are strong and well-developed, and the short-shoots bearing the cymes are either cushion-like, or if they grow out, rarely exceed two inches in length. In *B. triflora*, on the other hand, the spines are short and slender, $\frac{1}{8}$–$\frac{1}{2}$ in. long, and the flowering shoots may attain a length of 6–8 inches. Even when it is borne in mind that fully grown trees of *B. Roxburghii* are often unarmed (Beddome, Flora Sylvatica, vol. ii. p. l.), the differences between *B. Roxburghii* and *B. triflora* seem sufficient to justify the retention of the latter as an independent species.

It is much to be desired, however, that full material of each species illustrating the various stages of development from the production of the new leafy shoots to the time of the maturation of the fruit should be gathered from single trees. Until this is done, a satisfactory comparison of *B. Roxburghii* and *B. triflora* cannot be made.

Balanites Roxburghii, as here understood, is confined to India proper, and *B. triflora* to Upper Burma. *B. triflora* was first gathered by Griffith at Sheemnaga Pagoda near Ava in May, 1837, and subsequently by Smales at Yeu in May, 1900. Griffith refers to it as "a curious Rutaceous-looking decandrous thorny tree" (Journals, p. 106). Both specimens bear flowering shoots.

The species of the series *Roxburghianae* may now be distinguished as follows :—

Spines present ; fruits not cylindric-clavate :—
  Spines either unbranched, or the lateral branches much shorter than the main spine :—
    Spines ½–3 in. long ; cymes borne on short-shoots which are either much contracted and cushion-like, or, if elongated, do not exceed 2¼ in. in length
      1. *B. Roxburghii.*
    Spines ⅛–½ in. long ; cymes borne on shoots which may attain 6–8 in. in length ... ... 2. *B. triflora.*
  Spines bifurcate owing to the vigorous growth of a lateral branch which often nearly equals the upper part of the main spine and pushes it more or less on one side :—
    Fruits ellipsoid or ovoid, 4–4¾ in. long :—
      Fruit ellipsoid, 4½ in. long, 3 in. in diameter, deeply 5-grooved ; seed 1¾ in. long ... 3. *B. Wilsoniana.*
      Fruit ovoid, 4–4¾ in. long, 2¼–2¾ in. in diameter ; seed 3 in. long ... ... 4. *B. Tieghemi.*
    Fruits oblong-ellipsoid, 1½-1¾ in. long 5. *B. Maughamii.*
Spines absent ; fruits cylindric-clavate or subcylindric, 2½–3 in. long ... ... 6. *B. Dawei.*

1. **B. Roxburghii**, *Planch.* in Ann. Sc. Nat. ser. 4, vol. ii. p. 258 ; Brandis, For. Fl. p. 59 ; A. W. Bennett in Fl. Brit. Ind. vol. i. p. 522 ; Watt, Dict. Econ. Prod. vol. i. p. 363 ; Prain, Bengal Plants, vol. i. p. 308 ; Cooke, Fl. Bombay, vol. i. p. 195 ; Talbot, For. Fl. Bombay, vol. i. p. 210 ; Brandis, Indian Trees, p. 124, excluding the locality Burma. *B. aegyptiaca*, var. *Roxburghii*, Duthie, Fl. Upper Gangetic Plain, vol. i. p. 145. *Ximenia aegyptiaca*, Roxb., Fl. Ind. ed. Carey, vol. ii. p. 253, non Linn. *Balanites aegyptiaca*, Wall. Cat. 6855 ; Royle, Ill. p. 154 ; Wight, Ic. vol. i. t. 274 ; Beddome, Fl. Sylv. vol. ii. p. l., Anal. gen. t. 8, fig. 2 ; non Delile.

Central and South India, Sikkim, Behar.

2. **B. triflora**, *Van Tiegh.* in Ann. Sc. Nat. ser. 9, vol. iv. p. 253.

Upper Burma. Near Ava, *Griffith.* Yeu, *Smales.*

Kurz, For. Fl. Brit. Burma, vol. i. p. 204, records *B. Roxburghii* from "the dry forests of Prome and Ava." His description appears to have been drawn up partly from specimens of *B. Roxburghii* and partly from *B. triflora.*

3. **B. Wilsoniana**, *Dawe et Sprague* in Journ. Linn. Soc., Bot., vol. xxxvii. p. 506 ; Mildbraed in Wiss. Ergebn. Deutsch. Zentr.-Afr.-Exped. 1907—1908, vol. ii. p. 422, t. 47.

Uganda. Kibale Forest, *Dawe*, 511 ; also found by Mr. Dawe in the Unyoro and Semliki Forests. Native name "Lukauyu." Congo State. Stanleyville District : between Beni and Muera, *Mildbraed*, 2352 ; also observed by Dr. Mildbraed at Kifuku (near Irumu) on the upper Irumu River.

B. Wilsoniana was originally described from fruiting material, the flowers being unknown. The very clear figure given by Dr. Mildbraed represents the petals as villous on the upper surface, and the species is accordingly placed in the series *Roxburghianae*.

4. **B. Tieghemi**, *A. Chevalier* in Bull. Soc. Bot. France, vol. lviii. Mém. 8, p. 145.

Ivory Coast. Indénié, between Diambarakrou and Borobo, *Chevalier*, 17,741. Basin of the Sassandra, between Soubré and Guidéko, *Chevalier*, 17,992.

Evidently very closely allied to *B. Wilsoniana*, and therefore placed provisionally in the series *Roxburghianae*, although the flowers are not known.

5. **B. Maughamii**, *Sprague*, n. sp.*

Tree up to 50 ft. high ; bole irregularly shaped, up to $1\frac{2}{3}$ ft. in diameter. *Shoots* of two kinds, some barren and spiny, others flower-bearing and unarmed or nearly so. *Barren shoots* zigzag, green and pubescent in the first year, bearing forked spines above the axils, becoming more or less glabrous and blotched in their second year, and bearing leafy cushion-like short-shoots, lenticellate in their third year. *Leaves of the first year* : Petioles $\frac{1}{4}$–1 in. long, rather densely pubescent ; leaflets elliptic-ovate, acute at the apex, unequally rounded at the base, or obtuse on the upper side, rounded on the lower, $1\frac{1}{2}$–$3\frac{1}{2}$ in. long, 1–$2\frac{1}{2}$ in. broad, thinly coriaceous, glabrescent on both surfaces except the midrib, which is pubescent ; stipules subulate, $\frac{1}{2}$ lin. long. *Leaves of the short-shoots* : Petioles $\frac{1}{6}$–$\frac{1}{4}$ in. long ; leaflets elliptic or ovate-elliptic, rounded or obtuse at the apex, rounded at the base on the lower side, obtuse on the upper, $1\frac{1}{4}$–$1\frac{1}{2}$ in. long, $\frac{3}{4}$–$1\frac{1}{4}$ in. broad. *Spines* up to $2\frac{3}{4}$ in. long, usually with a single branch nearly equalling the upper part of the main spine. *Flower-bearing shoots* 1–6 in. long, bearing 9 leaves or fewer, densely greenish-pubescent. *Leaves of the flower-bearing shoots* (only seen in a relatively young state) densely greenish-pubescent ; petioles up to 1 in. long ; leaflets broadly ovate or elliptic, obtuse or rounded at the apex, rounded at the base, the base of the blade on the upper side being $\frac{1}{2}$–2 lin. above the base on the lower side, $1\frac{1}{2}$–$1\frac{3}{4}$ in. long, $1\frac{1}{4}$–$1\frac{1}{2}$ in. broad, paler and more densely pubescent on the lower surface. *Cymes* umbel-like, usually 2 in each axil, one above the other, sometimes solitary, the upper or solitary ones

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* It has been thought desirable to supply English descriptions of the two new species on account of the economic interest attached to them. Latin descriptions are given at the end of the article.

3–5-flowered, the lower 1–3-flowered. *Sepals* densely greenish-pubescent outside, whitish-silky inside. *Petals* apparently greenish, lanceolate when flattened out to their full length, ¼ in. long, whitish-villous on the upper surface except the uppermost ½–¾ lin., which is glabrous and much crumpled. *Filaments* 1¼–1½ lin. long. *Ovary* very densely covered with dirty greenish-white hairs. *Drupe* oblong-ellipsoid, 1½–1¾ in. long, 1 in. in diameter or rather more, with a deep basal depression and a smaller apical one at the bottoms of which are the scars left by the pedicel and style respectively, longitudinally 5-grooved in the upper part; epicarp crustaceous; mesocarp fibrous and spongy; endocarp woody, 1½–2 lin. thick. *Seed-coat* buff-coloured. *Embryo* oblong-ellipsoid, about 1 in. long, strongly grooved.

Portugese East Africa. Lebombo Mountains, and by the Umbeluzi River, *Maugham*. By the Rovuma River, *Kirk*. Madanda Forest, *Dawe*, 428.

According to Mr. Dawe, *B. Maughamii* is known in the Madanda Forest by the native name "Manduro."

The tree figured by Sim, For. Fl. Port. E. Afr. t. 56, as "*Trachylobium mozambicensis*" is apparently *Balanites Maughamii*. The description (p. 51) contains a mixture of characters, some derived from the *Balanites* figured by Mr. Sim, and others copied from the descriptions of the genus *Trachylobium* and of *T. Hornemannianum* given in Fl. Trop. Afr. vol. ii. p. 311. The floral characters given by Sim, and the statement that the fruit is 1–2-seeded, apply to the *Trachylobium*.

According to Sim's figure and description, the spines are "either simple or more frequently 2-spined (apparently dichotomous), or sometimes several-spined."

Sim states that the tree has a valuable hard timber, and that it is frequent in the extratropical districts, and present but less common in the northern districts. Judging from the localities where it is known to occur, *B. Maughamii* might be expected to do well in tropical and subtropical countries with a well-marked dry season. It would not be advisable to plant it on a large scale, however, until a satisfactory method of extracting the kernels has been devised (*see* p. 138).

6. **B. Dawei**, *Sprague*, n. sp. *Shoots* unarmed, of two kinds, some barren, others flower-bearing. *Barren shoots* straight, rather stout and densely greenish-white-pubescent in the first year, bearing 3 buds above the axils, one above the other, subsequent years growth not known. *Leaves of the first year* (only seen in a relatively young state): Petioles ¾–1¼ in. long; leaflets broadly ovate, apiculate from a rounded, truncate or retuse apex, rounded at the base, the base of the blade on the upper side being about 1½ lin. above the base on the lower side, 2½–3 in. long, 2–2½ in. broad, thinly herbaceous, distinctly different in colour on the upper and lower surfaces, puberulous on the upper, densely greenish-white-pubescent on the lower; stipules narrowly triangular, 1–1½ lin. long, tomentellous. *Flower-bearing shoots* 1–6 in. long, bearing 6 leaves or fewer, densely greenish-white-pubescent. *Leaves of the flower-bearing shoots* like those of the barren shoots, but rather smaller, glabrescent on the

upper surface, the upper ones sometimes acute at the apex. *Cymes* solitary or 2 in each axil, one above the other, the upper or solitary ones simple, 3–7-flowered, or racemosely branched up to 12-flowered, the lower cymes 1–3-flowered. *Petals* oblanceolate when flattened out to their full length, about $\frac{1}{3}$ in. long, crumpled tip hardly 1 lin. long. *Filaments* $1\frac{1}{2}$ lin. long. *Ovary* very densely covered with whitish hairs. *Drupe* cylindric-clavate, $2\frac{1}{2}$–3 in. long, with a slight basal depression, and no apical one or hardly any, longitudinally 5-grooved from apex to base. *Embryo* clavate, $1\frac{3}{4}$ in. long, acute at the base.

Portuguese East Africa. Madanda Forest, *Dawe*, 435.

Economic Value of the two New Species.

Fruits of *Balanites Maughamii* have been examined recently at the Imperial Institute, and the results obtained for that species will no doubt apply also to *B Dawei*, which is very closely allied (Bull. Imp. Inst. 1912, vol. x. pp. 548–9).

According to the report, it seems unlikely that the fruits of *B. Maughamii* can be of economic value for export, owing to the difficulty, first, of removing the external sugary pulp, and then of extracting the kernel from the thick fibrous shell in which it is enclosed.

The sample was too small to enable the percentage of oil in the kernels to be determined. The specimen of oil was clear, yellow and liquid, possessing no marked smell or taste. The constants of the oil are as follows:—

Specific gravity 0·916; saponification value 198·5; iodine value 100.

The oil resembles that of *B. aegyptiaca* in appearance and general character, and if produced on a commercial scale it would probably realise the current price of refined cotton-seed oil, but it is thought, that the difficulties mentioned above would prevent its production on a large scale.

It may nevertheless be of considerable importance for local consumption. A detailed account of the uses of *B. aegyptiaca* is given in Kew Bull., Add. Ser. vol. ix. pp. 138–139. Much of the information there given will no doubt apply also to *B. Maughamii*.

Specierum Novarum Descriptiones.

Balanites Maughamii, *Sprague*; affinis *B. Roxburghii*, Planch., et *B. triflorae*, Van Tiegh.; ab illa ramulis floriferis foliatis hornotinis bene evolutis e ramis annotinis inermibus vel subinermibus ortis; ab hac petalis lanceolatis multo latioribus villosioribus, antheris duplo longioribus; ab ambabus ramis annotinis fusco-maculatis, foliolis majoribus basi inaequialte rotundatis distinguitur.

Arbor usque ad 15 m. alta, trunco irregulari usque ad 0·5 m. diametro. *Rami* alteri steriles, spiniferi, alteri fertiles, inermes vel subinermes. *Rami steriles* anfractuosi, anno primo virides, pubescentes, spinas bifurcatas (rarius simplices) supra-axillares gerentes, anno secundo plus minusve glabrescentes, leviter fusco-maculati, ramulos abbreviatos foliatos saepius ad pulvinos reductos interdum usque ad 2·5 cm. longos gerentes, anno tertio nitiduli,

lenticellati lenticellis oblongis pluribus saepe longitudinaliter confluentibus. *Folia primaria* : Petioli 0·6–2·5 cm. longi, densiuscule pubescentes ; petioluli 3–4 mm. longi ; foliola elliptico-ovata, apice acuta, basi inaequaliter rotundata vel latere superiore basi obtuso tantum, 4–8·5 cm. longa, 2·7–6 cm. lata, tenuiter coriacea, utrinque glabrescentia nervo medio utrinque pubescente excepto ; nervi laterales utrinque 6–7, patuli, procul a margine anastomosantes, utrinque prominuli ; stipulae subulatae, 1 mm. longae. *Folia ramulorum abbreviatorum* : Petioli 4–7 mm. longi, dense pubescentes ; petioluli 2 mm. longi ; foliola elliptica vel ovato-elliptica, apice rotundata vel obtusa, rarius acuta, latere inferiore basi rotundato superiore obtuso, 3–4 cm. longa, 2–3 cm. lata. *Spinae* usque ad 7 cm. longae, saepius ramulo unico divergente. *Rami fertiles* inermes (vel spinulas nonnullas supra-axillares usque ad 4 mm. longas tantum gerentia), anno secundo 2–4 mm. diametro, fusco-maculati vel fusci, tenuiter pubescentes, ramulos floriferos hornotinos gerentes. *Ramuli floriferi* 2–15 cm. longi, basi 1–2·5 mm. diametro, folia usque ad 9 gerentes, ut pedunculi, pedicelli sepalaque extra dense viridulo-pubescentes ; internodia 1·5–4 cm. longa. *Folia ramulorum floriferorum* (juniora tantum visa) : Petioli 1–2·5 cm. longi, dense viridulo-pubescentes ; petioluli 4–7 mm. longi ; foliola late ovata vel elliptica, apice obtusa vel rotundata, rarius acuta, basi inaequialte rotundata, basi lateris superioris 1–4 mm. supra basin lateris inferioris sita, 3·5–4·5 cm. longa, 3–3·5 cm. lata, chartacea, paullo discolora, supra tenuiter, subtus dense viridulo-pubescentia, nervis lateralibus utrinque prominulis inconspicuis. *Cymae* axillares, solitariae, vel saepius binae, superpositae, superiores seniores ; cymae solitariae vel superiores 3–5-florae, inferiores 1–3-florae ; pedunculi 1–5 mm. longi ; pedicelli 3–5 mm. longi. *Sepala* ovato-oblonga vel elliptico-oblonga, acuta, vix 5 mm. longa, 2·3–2·5 mm. lata, extra dense viridulo-pubescentia, intra albo-sericea. *Petala* infra discum inter ejus cuspides areolis ellipticis inserta, lanceolata, 6–7 mm. longa, 2–2·5 mm. lata, parte superiore glabra corrugata 1–1·5 mm. longa, parte superiore exclusa anguste obovata, supra albo-villosa. *Discus* pulvinaris, minute papillatus, supra excavatus margine truncato, in toto 1·5 mm. altus, parte excavata 0·6–0·7 mm. profunda ; disci pars superior quam inferior pallidior, truncato-conica, 1 mm. alta, margine inferiore 10-crenato sinibus sepalis petalisque opposita ; pars inferior stamina gerens, margine inferior 5-cuspidato cuspidibus oppositisepalis. *Stamina oppositisepala* in parte inferiore areolarum rhomboidearum supra cuspides inserta ; filamenta 2·8–3 mm. longa ; antherae 1·6–1·7 mm. longae. *Stamina oppositipetala* infra sinus disci partis superioris inserta, labro minuto disci partis inferioris ab areolis petalorum disjuncta ; filamenta 2·5 mm. longa ; antherae 1·5–1·6 mm. longae. *Ovarium* subglobosum, 1·2–1·4 mm. altum, sordide viridulo-albido-tomentellum ; stylus 0·8 mm. longus. *Drupa* oblongo-ellipsoidea, 3·5–4·5 cm. longa, 2·5–2·8 cm. diametro, basi cicatrice pedicelli valde impressa, apice cicatrice styli minus sed conspicue impressa, superne 5-sulcata sulcis e cicatrice styli deorsum divergentibus ; epicarpium crustaceum, castaneum, 0·7 mm. crassum ; mesocarpium fibroso-spongiosum, in sicco glutinosum, circiter 3 mm. crassum, butyro redolens ; endocarpium lignosum, extra fibrosum, 3–4 mm. crassum. *Testa* duplex,

pallide fulva ; embryo oblongo-ellipsoideus, circiter 2·5 cm. longus, valde sulcatus. —— *Trachylobium mozambicense*, Sim, For. Fl. Port. E. Afr. p. 51, excl. char. nonnull., t. 56, non *T. mossambicense*, Klotzsch.

Portuguese East Africa. Lebombo Mountains, and by the Umbeluzi River, *Maugham*. By the Rovuma River, *Kirk*. Madanda Forest, *Dawe*.

According to Mr. Dawe, *B. Maughamii* is known in the Madanda Forest by the native name "Manduro."

Balanites Dawei, *Sprague* ; affinis *B. Maughamii*, Sprague, a qua fructibus elongatis petalorumque forma distinguitur.

Arbor 10–15 m. alta, trunco irregulari. *Rami* exstantes inermes, alteri steriles, alteri fertiles. *Rami steriles* rectiusculi, crassiusculi, anno primo leviter costati, ut petioli petiolulique dense viridulo-albo-pubescentes, inferne 6 mm. diametro ; internodia 2·5–4 cm. longa. *Folia* (juniora tantum visa) gemmas tres seriales suffulcientia, quorum suprema 2 mm. longa, intermedia triplo minor, infima minima ; petioli 2–3 cm. longi, canaliculati ; petioluli 1–1·2 cm. longi ; foliola late ovata, ex apice rotundato truncato vel retuso apiculata, basi inaequialte rotundata, basi lateris superioris circiter 3 mm. supra basin lateris inferioris sita, 6–7·5 cm. longa, 5–6 cm. lata, tenuiter herbacea, manifeste discolora, supra puberula, subtus dense viridulo-albo-pubescentia ; nervi laterales utrinque 6–7, patuli, procul a margine anastomosantes, utrinque prominuli ; rhachis supra insertionem petiolulorum in appendicem tomentellam 3 mm. longam producta ; stipulae anguste triangulares, 2–3 mm. longae, tomentellae. *Rami fertiles* anno secundo circiter 3 mm. diametro 15–20 cm. infra apicem, leviter sulcati, fusco-maculati, tenuiter pubescentes, ramulos floriferos hornotinos gerentes. *Ramuli floriferi* 2–15 cm. longi, inferne 1·5–3 mm. diametro, folia usque ad 6 gerentes, ut petioli, petioluli, pedunculi pedicellique dense viridulo-albo-pubescentes ; internodia 1·3–4·5 cm. longa. *Folia ramulorum floriferorum* iis ramorum sterilium similia at paullo minora, supra glabrescentia, superiora interdum acuta. *Cymae* axillares, solitariae, vel binae, superpositae, superiores seniores ; cymae solitariae vel superiores simplices, 3–7-florae, vel racemosim ramosi usque ad 12-florae, bracteis triangulari-ovatis 2 mm. longis tomentellis ; cymae inferiores 1–3-florae ; pedunculi 0·1–1 cm. longi ; pedicelli 0·7–1 cm. longi. *Sepala* deflexa, ovato-oblonga vel elliptico-oblonga, 5 mm. longa, 2–2·8 mm. lata, extra dense viridulo-albo-pubescentes, intra albo-sericea. *Petala* oblanceolata, 8–9 mm. longa, 2–2·5 mm. lata, parte superiore glabra corrugata vix 2 mm. longa excepta supra densiuscule albo-villosa. *Discus* in toto circiter 1·8 mm. altus, parte excavata 0·6–0·8 mm. profunda ; pars superior 1 mm. alta. *Filamenta* 3–3·2 mm. longa ; antherae 1·5–1·7 mm. longae. *Ovarium* circiter 1·3 mm. altum, albido-tomentellum ; stylus 0·8 mm. longus. *Drupa* clavato-cylindrica vel subcylindrica, 6·5–8 cm. longa, 2–3 cm. diametro, basi cicatrice pedicelli leviter impressa, apice cicatrice styli haud vel vix impressa, ab apice ad basin 5-sulcata sulcis superne magis conspicuis. *Embryo* clavatus, 4·5 cm. longus, basi acutus.

Portuguese East Africa. Madanda Forest, *Dawe*.

Explanation of the Plates.

Balanites Maughamii.

Fig. 1, part of barren shoot in the first year of its growth, showing the supra-axillary forked spines and a small bud beneath them.
Fig. 2, part of barren shoot in the second year, bearing a cushion-like leafy short-shoot.
Fig. 3, flowering shoot.
Fig. 4, expanded flower.
1–3, natural size ; 4, enlarged.

Balanites Dawei.

Fig. 1, barren shoot in the first year of its growth, showing two of the three serial buds in each axil (the lowermost bud being concealed by the stipules).
Fig. 2, flowering branch.
Fig. 3, expanded flower.
1–2, natural size ; 3, enlarged.

XXI.—NEW ORCHIDS: DECADE 40.

391. **Stelis barbata,** *Rolfe* ; a *S. Endresii*, Reichb. f., sepalis longe barbatis et labello tridenticulato differt.

Caules secondarii obsoleti vel brevissimi. *Folia* breviter petiolata, oblonga vel anguste elliptico-oblonga, tridenticulata, coriacea vel subcarnosa, 2–4 cm. longa, 5–7 mm. lata. *Scapi* gracillimi, 6–8 cm. longi, vaginis paucis tubulosis apice ovatis obtecti ; racemi secundi, 1·5–2 cm. longi, multiflori. *Bracteae* ovatae, acutae, basi tubulosae, 1·5–2 mm. longae. *Pedicelli* 2–2·5 mm. longi. *Flores* 3 mm. diametri. *Sepala* subreflexa, aequalia, ovata, subobtusa, facie longe barbata. *Petala* suborbiculari-ovata, obtusa, concava, 0·75 mm. longa. *Labellum* tridentatum, 0·75 mm. longum ; lobi laterales rotundati, subincurvi ; lobus intermedius suborbicularis. *Columna* brevissima, tridenticulata.

Costa Rica. Near Cachi, *Lankester*.

Flowered at Kew in November, 1912. The flowers are ochreous green, with numerous rather long purple hairs on the sepals, a broad red-purple blotch on the upper part of the petals, and a smaller blotch on the front lobe of the lip.

392. **Eria** (§Cylindrolobus) **trilamellata,** *Rolfe* ; affinis *E. truncatae*, Lindl., sed planta minora, pedicellis glabris, et labelli lobo intermedio breviter trilobo differt.

Herba epiphytica, circiter 10 cm. alta. *Pseudobulbi* clavati, basi attenuati, 4–7 cm. longi, medio 5–9 cm. lati, apice 2–3-phylli. *Folia* lanceolata vel oblongo-lanceolata, subacuta, subcoriacea, 3·5–6 cm. longa, 0·8–1 cm. lata. *Scapi* terminales, circiter 2 cm. longi, apice biflori. *Bracteae* ovatae vel ovato-oblongae, acutae vel apiculatae, circiter 1·5 cm. longae, canaliculatae vel subconcavae, patentes, pallide virides. *Pedicelli* circiter 1·3 cm. longi, glabri. *Flores* mediocres. *Sepalum* posticum elliptico-oblongum, subobtusum, concavum, 1·4 cm. longum ; sepala lateralia falcato-oblonga, obtusa, basi concava, 1·4 cm. longa ; mentum saccatum, 4 mm.

longum. *Petala* subfalcato-oblonga, obtusa, 1·3 cm. longa. *Labellum* 8 mm. longum, apice breviter trilobum ; lobi laterales late oblongi, incurvi, truncati, 2·5–3 mm. lati ; lobus intermedius 1·5 mm. longus, 3 mm. latus, breviter tridentatus ; discus trilamellatus, lamellis lateralibus a basi ad medium extensis glabris, lamella intermedia a medio ad apicem extensa dense vestita. *Columna* lata, 5 mm. longa.

Siam. Bangkok, *C. Roebelen*.

Sent to Kew by M. Roebelen, from Bangkok, and flowered in the collection in February, 1913. The bracts are light emerald green, and the flowers white, with a light brown front lobe and a very hairy brown keel in front. The short lateral keels and base of the lip are also stained with the same colour, and there is a round yellow blotch on the base of the column and a brown papillose blotch on the front of the column foot.

393. **Acanthophippium sinense**, *Rolfe* ; ab *A. striato*, Griff., foliis latioribus, scapis gracilioribus et paucifloris, et labello ampliore differt.

Herba terrestris. *Caules* subcylindrici, 5–7 cm. longi, vaginis spathaceis ovatis membranaceis amplis obtecti, apice diphylli. *Folia* petiolata, limbus late obovato-ellipticus, abrupte acuminatus, quinquenervis, membranaceus, 22–24 cm. longus, basi cuneatus ; petiolus circiter 15 cm. longus. *Scapi* erecti, 12–15 cm. longi, basi vaginis spathaceis numerosis membranaceis imbricatis obtecti, 2–3 flori. *Bracteae* oblongo-lanceolatae, acuminatae, 2·5–3 cm. longae. *Pedicelli* 1·3–1·5 cm. longi. *Flores* mediocres. *Sepalum* posticum late elliptico-oblongum, obtusum, 2 cm. longum ; sepala lateralia oblique ovata, subobtusa, 2 cm. longa ; mentum conicum, 1·3 cm. longum. *Petala* ovato-oblonga, subobtusa, 2 cm. longa. *Labellum* unguiculatum ; limbus latissime hastatus, apice triangulari-apiculatus, 1·4 cm. longus, 2·4 cm. latus, membranaceus ; discus laevis ; unguis 1 cm. longus. *Columna* clavata, 1·3 cm. longa.

China. Swatow District : E. Kwangtung ; collected on the Han Expedition, April, 1909, *S. T. Dunn*, in Hongkong Herb., 6504a.

394. **Phaius sinensis**, *Rolfe ;* habitu *P. nano*, Hook. f., sed labello angustiore apiculato et calcarato differt.

Herba terrestris. *Pseudobulbi* breves, crassiusculi. *Folia* elliptico-lanceolata, acuta, plicata, circiter 15 cm. longa. *Scapi* erecti, circiter 25 cm. alti, vaginis spathaceis obtecti, pauciflori. *Bracteae* elliptico-lanceolatae, acuminatae, conduplicatae, 3 cm. langae. *Pedicelli* 1·6 cm. longi. *Flores* mediocres. *Sepalum* posticum lanceolatum, acutum vel acuminatum, 2·7 cm. longum ; sepala lateralia oblongo-lanceolata, acuminata, 2·8 cm. longa, basi obliqua. *Petala* lanceolata, acuta, membranacea, 2·5 cm. longa. *Labellum* subtrilobum, 2·6 cm. longum, 1·8 cm. latum ; lobi laterales oblongi, apice rotundati, subundulati ; lobus intermedius orbiculari-quadratus, apiculatus, undulatus, 8 mm. latus ; discus bicarinatus, pubescens ; calcar oblonga, subacuta, leviter curvata, 5 mm. longa. *Columna* clavata, 1·7 cm. longa.

China. Swatow District : E. Kwangtung ; collected on the Han Expedition, April, 1909, *S. T. Dunn*, in Hongkong Herb., 6504.

395. **Cycnoches Cooperi**, *Rolfe*; a *C. pentadactylo*, Lindl., sepalis petalisque aequibiliter brunneo-suffusis et labelli lobis lateralibus latioribus differt.

Pseudobulbi fusiformi-oblongi, circiter 30 cm. longi, foliosi. *Folia* arcuata, elliptico-lanceolata, breviter acuminata, plicata, 20–35 cm. longa, 5–7 cm. lata. *Racemi* arcuati, 15–20 cm. longi, densi, multiflori, basi vaginis spathaceis obtecti. *Bracteae* lanceolatae, acutae, concavae, circiter 2 cm. longae. *Pedicelli* 4 cm. longi. *Flores* masculi speciosi, fragrantes. *Sepalum* posticum oblongo-lanceolatum, subacutum, incurvum, concavum, 4 cm. longum; sepala lateralia subfalcato-oblonga, acuta, 3·5 cm. longa. *Petala* falcato-oblonga, acuta, 3·5 cm. longa. *Labellum* unguiculatum; limbus 5-lobus, basi concavus, 1·5 cm. longus, 1 cm. latus; lobus terminalis lanceolato-linearis, acuminatus, 1 cm. longus; lobi laterales rotundato-oblongi, obtusi, 5 mm. longi, apice oblique incurvi; lobi intermedii lineares, acuti, incurvi, 2 mm. longi; unguis 1·5 cm. longus, infra medium dente oblongo incurvo 4 mm. longo instructus. *Columna* arcuata, gracilis, apice clavata, 3·5 cm. longa.

S. Peru. *L. Forget.*

Flowered with Messrs. Sander & Sons, St. Albans, in January, 1913, when it received an Award of Merit from the Royal Horticultural Society. The plant is now in the collection of the Rev. J. C. B. Fletcher, Mundham Vicarage, Chichester, who has kindly forwarded materials for description and preservation. The sepals and petals are light mahogany brown, the side lobes of the lip whitish, and the column dull purple. The female flowers are not yet known.

396. **Oncidium bidentatum**, *Rolfe*; ab *O. fascifero*, Reichb. f., scapo subflexuosa brachyclado, labello basi lato, et columna inter alam bidentifera differt.

Pseudobulbi ovoideo-oblongi, subcompressi, 5–7 cm. longi, apice diphylli, basi diphylli. *Folia* arcuata, lineari-oblonga, subacuta, 15–18 cm. longa. *Scapi* graciles, subflexuosi, fere 2 m. alti; panicula elongata, brachyclada, ramuli subdistantes, pauciflori, subflexuosi. *Bracteae* ovatae vel ovato-lanceolatae, acutae, membranaceae, 0·7–1·4 cm. longae. *Pedicelli* circiter 2 cm. longi. *Flores* mediocres. *Sepalum* posticum breviter unguiculatum, elliptico-oblongum, subacutum, undulatum, 1–1·2 cm. longum; sepala lateralia unguiculata, libera, lanceolata-oblonga, subacuta, undulata, 1·2–1·4 cm. longa. *Petala* elliptico-oblonga, subacuta, undulata, circiter 1 cm. longa. *Labellum* late panduratum, circiter 1 cm. longum, basi sublatius; lobi laterales quadrati vel late oblongi, truncati; lobus intermedius dilatatus, emarginatus vel breviter bilobus, minutissime crenulatus; crista carnosa, late obovata, margine tuberulato-crenulata, apice lobo parvo membranaceo dilatato et basi cornu oblongo suberecto 1·5 mm. longo instructa. *Columna* lata, 3 mm. longa, alis apice angustis vel subobsoletis basi subangulatis, inter alam utrinque dentem oblongum descendentem instructa.

Ecuador. Huigra, in cactus region, 1225 m., *L. Lipscomb.*

Sent for determination by Mrs. Lipscomb, Wilton Grove, Wimbledon, who received it from her son, Mr. Lanceolot J. Lipscomb, when residing in Ecuador. The flowers are yellow, with a large amount of brown on the sepals and petals, and on the basal half of the lip.

397. **Dendrocolla Pricei**, *Rolfe* ; affinis *D. albae*, Ridl., sed foliis et scapis brevioribus, bracteis latis et obtusis et sepalis lateralibus multo latioribus differt.

Herba epiphytica. *Caulis* brevis. *Folia* subdisticha, lanceolato-oblonga, subobtusa, coriacea, patentia, 3–5 cm. longa, 7–9 mm. lata. *Scapi* axillares, gracillimi, 5–6 cm. longi, vaginis paucis brevibus spathaceis obtecti. *Bracteae* late ovato-squamaeformes, brevissime apiculatae, 1 mm. longae. *Pedicelli* 5 mm. longi. *Flores* mediocres. *Sepalum* posticum suberectum, oblongum, subobtusum, concavum, 8 mm. longum ; sepala lateralia oblique ovata, obtusa, subconcava, 6 mm. longa. *Petala* oblonga, obtusa, subconcava, 6 mm. longa. *Labellum* saccatum, 6 mm. longum, apice breviter trilobum ; lobi laterales auriculiformes, obtusi, subconcavi ; lobus intermedius subobsoletus, pubescens ; discus crista squamiformi instructus ; saccus 4 mm. longus, apice didymus. *Columna* ovato-oblonga, 2 mm. longa, latere subauriculata et incurva ; pollinia oblonga, sessilia ; glandula squamiformis.

FORMOSA. *W. R. Price.*

Sent to Kew in 1912 by Mr. W. R. Price, and flowered in the collection in February of the following year. The flowers are semi-pellucid white, with transverse brown bars on the sac of the lip, two orange blotches at the inner angles of the side lobes, and an orange apex to the crest.

398. **Cleisostoma acuminatum**, *Rolfe* ; a *C. breviracema*, Hayata, foliis longioribus et floribus fere duplo minoribus differt.

Herba epiphytica, nana, subacaules. *Folia* sessilia, anguste oblonga, acuminata, basi conduplicata, 9–15 cm. longa, 1·5–2·5 cm. lata. *Scapi* axillares, breves, circiter 1·5 cm. longi, subcorymbosi, pauciflori. *Bracteae* ovato-oblongae, obtusae, 2·5–3 mm. longae. *Pedicelli* 4–6 mm. longi. *Flores* parvi. *Sepala* incurva, subspathulato-oblonga, obtusa, 4 mm. longa, 2 mm. lata. *Petala* subincurva, oblonga, obtusa, 4 mm. longa, 1·5 mm. lata. *Labellum* 3-lobum ; lobus intermedius recurvus, late ovatus, subobtusus, 3·5 mm. longus ; lobi laterales erecti, subquadrati, truncati, 1 mm. lati, calcar ovoideo-globosum, dorsaliter subcompressum, 3 mm. latum, ore squama postica lata oblonga bifida subclausum. *Columna* lata, 2 mm. longa ; alae truncatae, carnosae, breves.

FORMOSA. *H. J. Elwes.*

Brought from Formosa by Mr. H. J. Elwes, and flowered in his collection at Colesborne, Cheltenham, in February, 1913. The sepals and petals are yellowish-green, with one or two large transverse purple blotches, and the lip cream white with a little yellow at the junction of the front and side lobes. The description is made from an inflorescence and a photograph of the plant.

399. **Mystacidium gracillimum**, *Rolfe* ; a *M. Batesii*, Rolfe, foliis latioribus, scapis et labelli calcare graciliioribus et floribus minoribus differt.

Folia lineari-oblonga, inaequaliter et brevissime bidentata, subcoriacea, 6–8 cm. longa, circiter 1 cm. lata. *Scapi* suberecti, gracillimi, 4–7 cm. longi, basi vaginis paucis tubulosis oblongis obtecti. *Bracteae* subpatentes, ovatae, subacutae, 2–3 mm. longae. *Pedicelli* gracillimi, 2·5–4 cm. longi. *Flores* parvi. *Sepalum*

posticum reflexum, ovatum, subacutum, convexum, circiter 1·5 mm. longum ; sepala lateralia descendentia, subparallela, linearioblonga, subobtusa, circiter 6 mm. longa. *Petala* obliqua, reflexa, oblonga, subacuta, 1·5 mm. longa, basi calcaris ore decurrentia. *Labellum* breviter trilobum, patente, 4–5 mm. longum ; lobus intermedius lineari-oblongus, obtusus, subcarnosus ; lobi laterales oblique oblongi, obtusi, reflexi, 1 mm. longi ; calcar pendulum, elongatum, gracillimum, 4 cm. longum, basi breviter infundibuliforme. *Columna* lata, brevissima ; pollinarii stipites 2, filiformes, breves ; glandulae distinctae, oblongae, parvae.

Uganda. *E. Brown.*

Flowered in the Royal Botanic Gardens, Glasnevin, in December, 1911, and again a year later. The flowers are semipellucid white.

400. **Glossula calcarata,** *Rolfe ;* a *G. tentaculata,* Lindl., labelli calcar clavato et triplo longiori facile distinguenda.

Herba terrestris, 25–40 cm. alta. *Folia* caulina, 3–4, sessilia, elliptico-lanceolata, acuta vel subobtusa, membranacea, 3·5–7 cm. longa, 1–2·3 cm. lata. *Scapi* 25–40 cm. alti ; racemi 8–15 cm. longi, laxi, multiflori. *Bracteae* ovatae-lanceolatae, acuminatae, 5–8 mm. longae. *Pedicelli* graciles, 5–7 mm. longi. *Flores* parvi. *Sepala* subconniventia, ovato-oblonga, obtusa, 3 cm. longa, uninervia ; posticum subconcavum. *Petala* ovato-oblonga, obtusa, uninervia, 3 mm. longa. *Labellum* cum basi petalorum connatum, tripartitum ; lobi laterales divergentes, filiformi-lineares, varie flexi, 0·8–1 cm. longi ; lobus intermedius triangulari-oblongus, obtusus, 2 mm. longus ; calcar clavatum, 4–5 mm. longum. *Columna* lata, 1 mm. longa.

S. China. Lo-fau-shan Mountains, 180 m., *Ford.* Hongkong, *Voretzsch.* Hongkong Herb., 9620, 9621.

Originally collected on the Lo-fau-shan Mountains by Mr. C. Ford, and distributed as *Glossula tentaculata,* Lindl., and afterwards in Hongkong by Dr. E. A. Voretzsch. The spur is clavate, and three times as long as in *G. tentaculata,* to which it bears a general resemblance in other respects. It is difficult to make out the structure of the minute column and its appendages from dried specimens, but the stigmatic processes are not clavate, as in *Habenaria,* and I am inclined to think the genus must be kept distinct as was done by Lindley.

XXII.—THE GENUS MARAH.

S. T. Dunn.

When Sir William Hooker came to examine the botanical collections brought home from Sir John Franklyn's Expedition and the accumulation of material collected by Douglas, Scouler, Michaux and others in North America for his *Flora Boreali-Americana,* only two *Cucurbitaceae* were noted.*

Some of Michaux' Canadian specimens he identified as *Sicyos angulatus,* Linn., but with them he associated certain other plants collected by Scouler and Douglas on the banks of the Columbia

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* Hook., Fl. Bor. Am., i, 20 (1834).

River (Oregon) bearing only male flowers, and which in fact represented, as it now appears, the first gatherings of the present genus. Six years later, with fuller materials in their hands, Torrey and Gray distinguished the Columbia River plants as a distinct species of the first-named genus (*Sicyos oregona*).*

It is not clear why it was not referred to the new genus, *Echinocystis*, appearing on the same page, with which its given characters seem better to agree, and to which it was subsequently reduced.

It was not until 1853 that the peculiar germination, the large tuberous roots and the marked fruiting characters of some plants obtained from N. California, convinced Kellogg that a distinct genus was represented. They were not associated by him with the Oregon species. But, like it and all the other species now recognised, its annual shoots spring from an extraordinarily large root—sometimes as large as a man's body—and climb by tendrils over bushes and small trees. In the early summer racemes of white or greenish male flowers and solitary female ones are produced from the axils of the palmately lobed leaves, and in the autumn the large prickly or bristly fruits are a conspicuous feature. Kellogg, in 1853, showed specimens and drawings of his species before the Californian Academy, special attention being drawn to the above remarkable characters. Two years later the Proceedings of that Academy—published at that period in a newspaper, "The Pacific"—contained a full description of this plant as a new genus under the name *Marah*,† so called from the bitter taste of the root.

At the meeting of the Academy, only a fortnight later, Kellogg exhibited specimens and drawings of a plant from Placerville having similar vegetative characters but different flowers and fruit, now recognised as *Marah* (*M. Watsoni*), but by him referred to *Echinocystis* (*E. muricata*).‡ As he was at first in doubt as to which of the two genera should receive it, it is surprising that the possible inconvenience of bestowing upon it the same trivial name as that of his original *Marah muricatus* did not occur to him.

In 1859 he added a second species to his genus, *Marah minima*§ from Cedros Island, but this is now referred to *Echinopepon*. In the same year appeared Naudin's classical account of the *Cucurbitaceae* cultivated in the Jardin des Plantes in Paris,‖ which contained a description and fine engraving of a plant raised from a tuber received from California, and which he referred to *Echinocystis* under the name of *E. fabacea*.

In 1876 Sereno Watson described another Big Root from the Island of Guadalupe, off the Mexican coast, referring it and the four previously described to *Megarrhiza*.¶

This excellent name proposed by Torrey a year before Kellogg published his genus *Marah* remained unfortunately unaccompanied by a description as a mere *nomen nudum* for some years after the other had been established, and cannot now be restored. It is

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* Torrey and Gray, Fl. N. Am., i (1840), 542.
† Proc. Calif. Acad., i. (1855), 38.
‡ l.c. 42, 56.
§ Proc. Calif. Acad., ii (1859), 18.
‖ Ann. Sci. Nat. 6e sér. xii, 154.
¶ *M. guadalupensis*, Watson in Proc. Am. Acad., xi, 138.

exactly synonymous with *Marah* as here circumscribed. In 1881 Cogniaux published in De Candolle's *Monographiae Phanerogamarum* his splendid monograph of this difficult Natural Order. *Marah* was constituted a section of *Echinocystis* to be distinguished by its enormous rootstocks, its subterraneous germination, and from all but § *Eu-echinocystis*—*i.e.*, from all but *E. lobata*—by the irregular apical bursting of its fruit. In the same year Greene described a curious species from the sandy banks of the upper Gila River in New Mexico.*

In 1885 the same botanist recognised the distinct status of the Big Roots inhabiting the south-west coast of California, and named them *Echinocystis macrocarpa*, believing them to be congeneric with the Eastern Balsam Apple (*E. lobata*), for which the generic name has 14 years' priority over *Megarrhiza*. But, in 1890, discovering a still earlier generic name for the last-mentioned species, *i.e.*, *Micrampelis* of Rafinesque (1808), he transferred all the seven Big Roots to it.

As the interior of California began to be more thoroughly submitted to botanical exploration several more species were discovered, including *E. horrida*† and *E. inermis*,‡ by Congdon in Mariposa County, and *E. scabrida*§, which appears to be nearly allied to the last, by Miss Alice Eastwood in Fresno County. In his enumeration of the Californian species Congdon (*Erythraea*, l.c.) employs the useful classification, which he attributes to Greene, depending upon the rotate or campanulate shape of the corollas. The two species added in the present paper bring the total number up to eleven.

There has been no doubt among botanists as to the affinity *inter se* of these plants since the same remarkable vegetative characters were seen to be shared by so many west coast species, but Kellogg was the only writer who clearly showed their generic distinction from the Balsam Apple (*E. lobata*) of the older states, which they resemble in flowers and fruit. Through all the numerous changes of name demanded by the views of different botanists upon the question of priority, the conception of the Big Roots as a natural group has remained intact. Cogniaux recognised them as a section, and Dr. J. N. Rose has proposed their re-establishment as a genus.‖

It is with the help of 82 sheets of excellent specimens courteously lent to the Royal Botanic Gardens by the Smithsonian Institution that I have undertaken the revision of the genus. The material in the Kew Herbarium is remarkably full and contains some particularly valuable old types, including some of Naudin's specimens of *E. fabacea* from the Paris garden and the Columbia River material (*E. oregona*) seen by Hooker.

The characters by which *Marah* is distinct from allied genera having already been referred to, a more particular account of the origin and present position of these genera will now be given. The first

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* *Megarrhiza gilensis*, Greene in Bull. Torr. Club, viii, 97.
† Erythraea, vii (1900), 184.
‡ Zoe, v (1901), 134.
§ Bull. Torr. Club, 1903, 500.
‖ Contrib. U.S. Nat. Herb., v (1897), 115.

known of all the allied species was the Balsam Apple for which Torrey and Gray founded the genus *Echinocystis* (1840). This is not the oldest name but the Vienna Congress of botanists directed that it should be retained. The older name of Rafinesque was considered obsolete from long disuse. *Marah* was recognised as distinct by Kellogg in 1855 as above described. This and *Echinopepon* were treated as sections of the first by Cogniaux in his monograph, the latter being distinguished by its normal (epigeous) germination, its small compressed corrugated seeds, 4–6 together in cells which open regularly by pores or by an operculum at the top. It was not until later that he admitted this group to generic rank. In 1890 (Proc. Calif. Acad. ser. 2, iii, 58) he described a reduced type with a one-celled ovary, and in the following year another with a two-celled ovary (*Brandegea* and *Vaseyanthus*) both having indehiscent fruits.

The distribution of these genera as far as is known at present is as follows :—*Echinopepon* is chiefly tropical but extends as far as the southern border of the United States in New Mexico. From a short distance north of this area *Marah* inhabits the country draining into the Pacific* as far as British Columbia. Between the two and overlapping both regions is *Brandegea* and, further south, *Vaseyanthus*. *Echinocystis* is a plant of the Eastern and Central States.

With the exception of the latter these genera are new to or at least not upheld in Bentham and Hooker's *Genera Plantarum*. They might perhaps be interpolated in Herbaria, in which the sequence of that work is adopted, as follows, with the numbers indicated.

Key to Genera allied to Echinocystis.

Fruit dehiscent.

Dehiscence of fruit irregular.	
Germination epigeous ; seeds compressed	51. *Echinocystis.*
Germination hypogeous ; seeds turgid	51–1. *Marah.*
Dehiscence of fruit regular	51–2. *Echinopepon.*
Fruit small, indehiscent.	
Ovary 1-locular	51–3. *Brandegea.*
Ovary 2-locular	51–4. *Vaseyanthus.*

Marah.

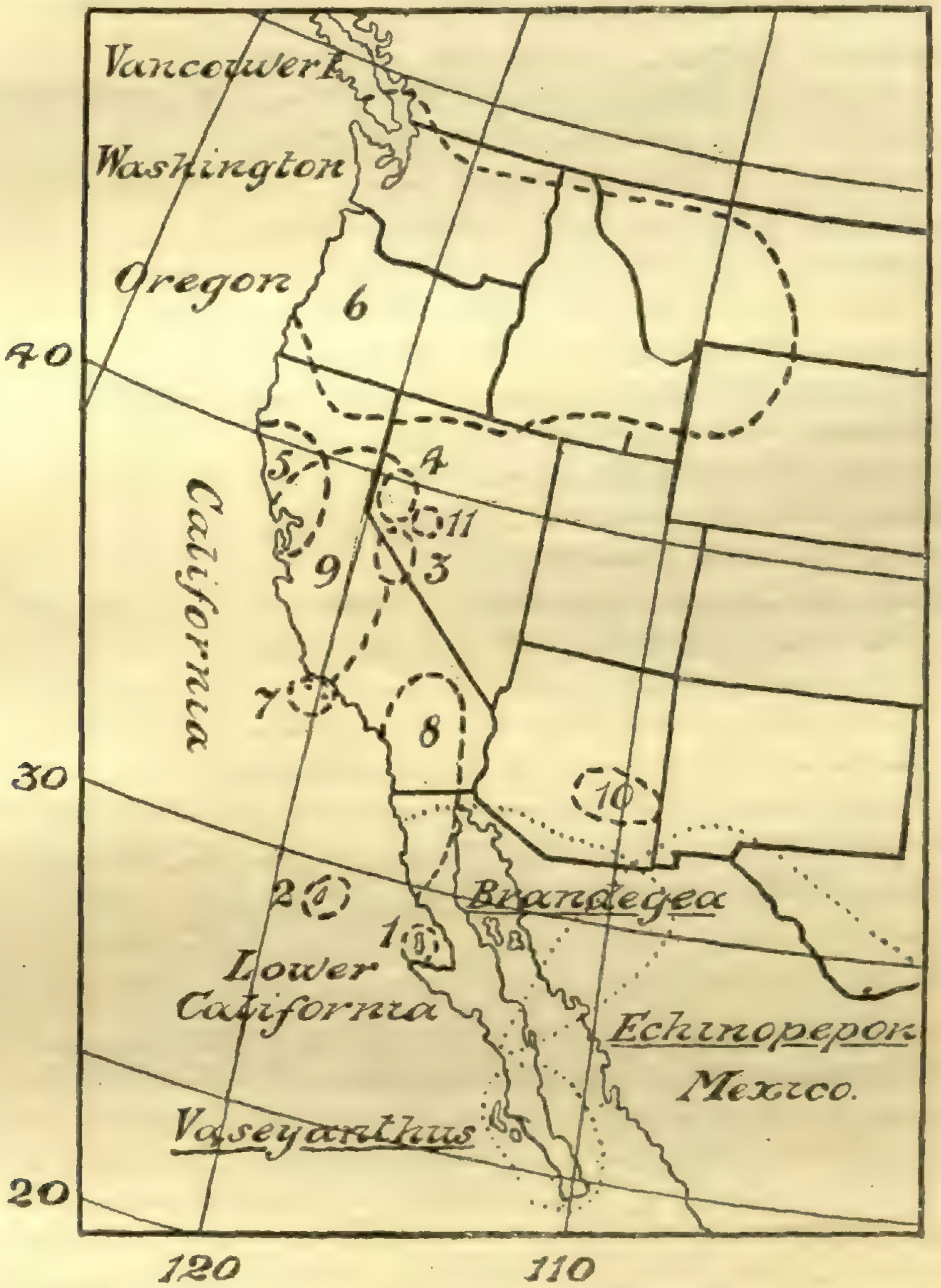
Marah, Kellogg in Proc. Calif. Acad., i. (1855), 38. *Flores* monoici. *Masculi* racemosi vel paniculati. *Calycis* tubus campanulatus vel pateriformis, lobis 5, filiformibus vel obsoletis. *Corolla* profunde 5-partita, rotata, vel 5-lobata, campanulata, lobis oblongis vel lanceolatis. *Stamina* 3, filamentis in columnam connatis ; antherae connatae, loculis flexuosis. *Foeminei* solitarii vel in eadem axilla cum masculis enati. *Calyx et corolla* maris. *Staminodia* nulla vel 3, libera vel stylo adnata. *Ovarium* ovoideum, rostratum, saepissime setiferum, 2–4-loculare ; stylus brevis, stigmate hemisphaerico 2–5-lobato ; ovula in loculis 1–8, erecta,

* *M. oregonus* extends into the Atlantic catchment area.

parietalia. *Fructus* siccus vel baccatus, longe dense echinatus vel setis fortibus vel laxis longis dense vel tenuiter vestitus, glaber vel breviter tomentosa, 1–4-locularis, intus fibrosus, ad 30-spermus. *Semina* varia, magna, laevia, turgida, margine saepe lineis fuscis notata.

Herbae scandentes. Germinatio hypogea. Radix maxima, tuberosa, perennis. Folia palmatim 5–7-lobata. Cirrhi 2–3-fidi, rarius simplices.

The 11 species are found only on the Pacific watershed of N. America from Vancouver to Lower California, with the exception of *M. oregonus* which extends as far as Nebraska.



MAP OF WESTERN STATES OF N. AMERICA.

The numbered areas enclosed by broken lines indicate the habitats of the different species of *Marah* as enumerated below. The distribution areas of the allied western genera, *Brandegea*, *Echinopepon*, and *Vaseyanthus* are shown by dotted lines.

1. M. micranthus.
2. — guadalupensis.
3. — horridus.
4. — Watsoni.
5. — muricatus.
6. — oregonus.
7. M. major.
8. — macrocarpus
9. — fabaceus.
10. — gilensis.
11. — inermis.

Clavis Specierum.

1.	Florum masculorum tubus campanulatus; petala erecta	2
	florum musculorum tubis rotatus; petala patentia	7
2.	flores masculi 1–3 mm. longi	1. *micranthus.*
	flores masculi 6 mm. longi vel longiores...	3
3.	ovarium setosum ad basin rostri abrupti	4
	ovarium glabrum vel in apicem glabrum infra rostrum angustatum; fructus glaber vel laxe setosus	5
4.	rostrum longum, pubescens; fructus parvus, globosus, setis mollibus ...	2. *guadalupensis.*
	rostrum breve, glabrum; fructus magnus, oblongus, fortiter spinosus	3. *horridus.*
5.	ovarium glabrum vel paucisetosum; semina globularia, haud zonata ...	4. *Watsoni.*
	ovarium fere ad apicem dense setosum...	6
6.	foliorum lobi oblongi, ad basin angustati; staminodia libera	5. *muricatus.*
	foliorum lobi triangulares, basi lati; staminodia angusta, stylo adnata ...	6. *oregonus.*
7.	flores 1 cm. diametro vel latiores ...	8
	flores ad 7 mm. diametro " "	9
8.	folia ad 30 cm. diametro; flores ad 1·4 cm. diametro; semina 4–8, ad 3·5 cm. diametro	7. *major.*
	folia ad 14 cm. diametro; flores ad 1 cm. diametro; semina 16, ad 2·5 cm. diametro	8. *macrocarpus.*
9.	fructus fortiter dense spinosus	9. *fabaceus.*
	fructus glaber vel setis mollibus ...	10
10.	pedicelli 3 mm. longi	10. *gilensis.*
	pedicelli 6 mm. longi	11. *inermis.*

1. **M. micranthus**, *Dunn*, sp. nov. *Caulis* tenuis, striatus, scabridus. *Folia* ambitu orbicularia, dimidio altius palmatim 5–7-lobata, 6–10 cm. diametro, supra et in margine brevissimis setis tuberculatis scabra, lobis oblongis sinuato-dentatis, sinubus rotundatis; petiolus bis folio brevior; cirrhi tenues, glabri, bifidi. *Flores masculi* racemosi; pedunculus communis gracilis, ut pedicelli et perianthii puberulus, vix maturus 2 cm. longus; pedicelli filiformes, 4 mm. longi. *Calycis tubus* campanulatus, 1 mm. longus, lobis obsoletis. *Petala* lanceolata, acuta, 1–1·5 mm. longa. *Columna staminea* brevis; capitulum antherarum 1 mm. longum, tubum calycinum paullo excedens. *Flores foeminei* non visi. *Fructus* ovatus, glaber, 4 cm. latus, 5 cm. longus, aculeis complanatis, 5–8 mm. longis dense armatus, 6–8-spermus. *Semina* ovata, 1·3 cm. longa, 8 mm. diametro, lineo nigro albo-marginato longitudinaliter cincta.

Lower California. Cedros Island, *Rose* 16,159. Flowers expanded while the fruit of the previous year is ripe, in March.

2. **M. guadalupensis,** *Dunn.* *Megarrhiza guadalupensis*, Watson in Proc. Am. Acad. xi. 115, 138. *Echinocystis guadalupensis*, Cogn. in DC. Monogr. Phan. iii. 819. *Micrampelis guadalupensis*, Greene, Pittonia, ii. 129 pp.*

The ovary has the same shape and the same covering of bristles as those of *M. fabaceus* and *M. macrocarpus* but the tomentum which persists in fruit distinguishes it from the other species of the genus.

GUADALUPE ISLAND (Mexico). *Anthony* 234, *Franceschi* 47, *Palmer* 33.

3. **M. horridus,** *Dunn.* *Echinocystis horrida*, Congd. in Erythraea, vii. (1900) 184.

CENTRAL CALIFORNIA. Mariposa County, the commonest species of the genus in the foot hills, *Congdon*; Tulare County, Kaweah River Valley (Sierra Nevada Mts.), *F. R. S. Balfour.*

4. **M. Watsoni,** *Dunn.* *Echinocystis muricata*, Kellogg in Proc. Calif. Acad. i. 57 (1855) *non* Cogn. *et non Marah muricatus*, Kellogg; *E. Watsoni*, Cogn. l.c. 819. *Megarrhiza muricata*, Wats. l.c. *Micrampelis Watsoni*, Greene, Pittonia, ii. 129.

CALIFORNIA. Placer and Amador Counties, *Hansen* 37. Brandegee (Zoe, i. 137) notes that the fruit is usually 4–8-seeded.

5. **M. muricatus,** *Kellogg* in Proc. Calif. Acad. i. 38 (1855) *Megarrhiza Marah*, Wats. l.c. 138. *Echinocystis Marah*, Cogn. l.c. 817; Congd. in Zoe, v. 134. *Micrampelis Marah*, Greene l.c. 129.

CALIFORNIA. Santa Clara, San Mateo, Mendocino, Marin and Sonoma Counties. *Baker* 450, 3200, *Brown* 778, *Chesnut* 245, *Greene*, *Heller & Brown* 5023, *Congdon*, *Jepson*, *Kellogg & Harford* 295, *McMurphy* 71, *Michener & Bioletti*, *Vasey*, *Wight* 13.

The leaves are large and the lobes most usually overlapping and divided by round sinuses. The male flowers are moderate in size.

6. **M. oregonus,** *Howell* in Fl. N.W. Am. i. (1897) 239. *Sicyos oregonus*, Torr. & Gr., Fl. N. Am. i. 542 (1840); *S. angulatus*, Hook. Fl. Bor. Am. i. 20 (1834) pp. *non* Linn. *Megarrhiza oregona*, Torr. Pacif. Rly. Rep. vi. 74 (1857) nomen; Wats. in Proc. Am. Acad. xi. (1876), 138. *Echinocystis oregona*, Cogn. l.c. *Micrampelis oregona*, Greene, l.c. 129.

N.W. UNITED STATES. Washington, Oregon, Idaho, Montana and Nebraska. *Applegate* 2194, *Ball*, *Cusick* 2523, *Hammond* 151, *Heller* 3873, *Heller & Brown* 5517, *Hinds*, *Howell*, *Lamb* 1184, *Lyall*, *Suksdorf.*

7. **M. major,** *Dunn*, sp. nov. *Caulis* robustus, ad 7 m. scandens, striatus, scabrellus. *Folia* ambitu orbicularia ad dimidium 5–7-lobata, ad 30 cm. diametro, glabra, sparse tuberculata, lobis ovatis sinuatis vel sinuato-dentatis, sinubus rotundatis vel obtusis; petiolus circiter bis folio brevior; cirrhi glabri, robusti, trifidi. *Flores masculi* albi, 2–3 cm. lati, in racemis 20–30 cm. longis dispositi; pedunculus communis ut pedicelli gracilis, glaber; pedicelli 2 cm.

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* The specimens from the islands off the coast of California may be a different species.

longi. *Calycis tubus* patulus, ut lobi utrinque sparse molliter tuberculatus ;· lobi lanceolati, acuti, tubo bis vel ter longiores. *Columna staminea* brevis, glabra ; capitulum antherarum 2 mm. longum, tubum paullo excedens. *Flores foeminei* 2·5 cm. longi. *Calyx corollaque* mari similes. *Ovarium* ovoideum, in rostrum equilongum glabrum angustatum, dense setosum ; stigma globosum, sessile ; loculi 4, 2-ovulati. *Fructus* ovoideus, 7 cm. longus, 4 cm. latus, aculeis complanatis 5–8 mm. longis sparsis armatus. *Semina* 4–8* ovata, compressa, magnitudine varia, ad 3·5 × 3 × 1 cm., lineo fusco lato in circumferentia majore notata.

S. California Islands. San Catalina, San Clementi, San Nicolas. *Trask* 91, 280, 281.

The plant is common in moist cañons in some of the islands. Trask records that its white flowers are produced in May and June and that its roots, which are often left partly exposed, are as large as small barrels.

8. **M. macrocarpus**, *Dunn*. *Echinocystis macrocarpa*, Greene in Bull. Calif. Acad. i. 188 (1885) ; Hall in Univ. Calif. Publ. Bot. i. 122. *Micrampelis macrocarpa*, Greene in Pittonia, ii. 129.

Southern and Lower California. Santa Barbara, San Diego, San Bernardino, Riverside, Los Angeles Counties and St. Quentin's Bay. *Abrams* 3130, *Bingham*, *Braunton* 748, 797, *Brewer* 150, *Colville & Funston*, *Brandegee* 3429, *Dunn*, *Eastwood* 93, *Hasse*, *Henshaw* 84 ? 219 ?, *Jones*, *Lieberg* 3116, *Orcutt*, *Palmer* 668, *Parish* 4140, 3633, *Shorting*, *Thurber* 578, *Vasey* 214, *Vesey* 35.

Frequent in the hills and Chaparral (scrub) belt where it flowers from February to May. It is characterised by its blunt overlapping leaf-segments and the deep rounded sinuses between them. From *M. fabaceus* to which it was at first referred it differs in its larger male flowers and in its seeds 14 or even as many as 29 in number, not 4 as is usual in *M. fabaceus*, and 2 cm. long not 4 cm. as in that species.

9. **M. fabaceus**, *Dunn*. *Echinocystis fabacea*, Naud. in Ann. Sci. Nat. sér. 4, xii. 154 (1859) ; Cogn. l.c. 816 ; Congd. l.c. 133. *Megarrhiza californica*, Torr. in Pacif. Rly. Rep. vi. 74 (1857) nomen ; Wats. in Proc. Am. Acad. xi. 138 (1876).

N. Central California. Coastal regions. Santa Clara, San Francisco, Monterey, Santa Barbara, Sonoma and Placer Counties. *Ames*, *Brewer* 1299, 2757, *Bridges* 118, *Cooper* 300, *Davy* 6806, *Baker* 512, *Ball*, *Heller* 7262, *Barclay* 119, *Hansen* 106, *Jones*, *Kellogg & Harford* 294, *Naudin*, *Plaskett* 96, *Samuels* 80, *Vasey* 213.

This species was described by Naudin from cultivated plants in the Jardin des Plantes in Paris. His type specimens in the Kew Herbarium agree exactly with those since contributed from natural habitats in central California.

10. **M. gilensis**, *Dunn*. *Megarrhiza gilensis*, Greene in Bull. Torr. Club, viii. (1881) 97. *Echinocystis gilensis*, Greene in Bull. Calif.

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* *fide* Brandegee in Zoe, 137.

SEEDS AND FRUITS OF MARAH.

To face page 153.]

Acad. i. 189., Pitt. i. 3. *Micrampelis gilensis*, Britt. in Trans. N.Y. Acad. viii. (1889) 67.

S.E. United States. Arizona and New Mexico. *Greene, Griffiths* 3920, *Jones, Palmer* 153, *Pringle, Rusby* 141, *Toumey.*

This species has the slender growth, small flowers and leaves of the eastern *Echinocystis lobata* but the perennial root and turgid seeds of the Pacific genus.

11. **M. inermis**, *Dunn.* *Echinocystis inermis*, Congd. in Zoe, v. 134 (1901).

California. Mariposa County. *Hansen* 1061 ?

Echinocystis scabrida, Eastw. in Bull. Torr. Club, 1903, 500 (from Fresno County) is unknown to me, but from the description it seems very near the above species.

Explanation of Plate.

Fig. 1.—Seed of *M. macrocarpus* (*Thurber*, 578).
Fig. 2.—Seed of *M. horridus* (2·5 cm. long).
Fig. 3.—Seed of *M. major*, 3·2 cm. long (*Trask*, 91).
Figs. 4, 5.—*M. horridus* (*F. R. S. Balfour*), old capsule and newly dehisced capsule.

XXIII.—NEW SPECIES OF SEDUM PRESERVED IN THE HERBARIA OF KEW AND THE BRITISH MUSEUM.

Raymond Hamet.

Sedum Mossii, **R. Hamet*, sp. nova.—*Planta* . . . *Radices* . . . *Caules* floriferi erecti ; graciliusculi, simplices (?), glabri. *Folia* alterna, sessilia, infra insertionem in calcar producta, glabra ; calcar integrum, obtusum ; lamina obovato-lanceolata vel sublanceolata, marginibus integerrimis, apice acuta et cuspidata, longior quam latior. *Inflorescentia* corymbiformis, satis laxa. *Pedicelli* calyce longiores vel paulo breviores. *Flores* satis numerosi. *Bracteae* superiores sessiles, infra insertionem in calcar productae, glabrae ; calcar integrum, obtusum ; lamina ovata, marginibus integerrimis, apice acuta, longior quam latior. *Calyx* glaber, segmentis 5 tubo longioribus infra insertionem in calcar non productis ovatis marginibus integerrimis, apice acutis et extra e papillis nonnullis instructis, longioribus quam latioribus. *Corolla* glabra, calyce longior, segmentis 5 tubo multo longioribus subovato-lanceolatis, marginibus integerrimis, apice acutis vix mucronatis, mucrone petali apicem leviter superante, longioribus quam latioribus. *Stamina* 10, glabra ; filamenta late linearia, oppositipetala, infra corollae medium inserta ; antherae late subreniformes, apice et basi emarginatae,

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* Cette espèce est dèdiée à M. le Dr. C. E. Moss, Conservateur de l'herbier de l'Université de Cambridge qui in a obligeamment communiqué les Crassulacés conservées dans cet établissement. Je le prie ici d'accepter cette dédicace en témoignage de ma grande reconnaissance.

paulo longiores quam latiores vel tam longae quam latae, superiores corollae medium superantes. *Carpella* 5, multiovulata, glabra, in stylos carpellis breviores attenuata. *Squamae* 5, sublineares, marginibus integerrimis, apice obtusae vel emarginatae, longiores quam latiores. *Folliculi* 5, multiseminati, erecti, lateribus internis non gibbosis. *Semina* obovato-oblonga, testa laevi nucleum duabus extremitatibus non superante.

Caules floriferi 10–11 cm. longi (?).—Foliorum calcar 1·4–1·5 mm. longum; lamina 0·8–1·6 cm. longa, 2·6–4·6 mm. lata.—Inflorescentia 3·5–4·5 cm. longa, 3–4·5 cm. lata.—Bractearum calcar 1·4–1·55 mm. longum; lamina 2·4–4·4 mm. longa, 1·2–2 mm. lata.—Pedicelli 2·75–4 mm. longi.—Calycis pars concreta 0·5–0·6 mm. longa; pars libera 2·4–3·25 mm. longa, 1·4–1·6 mm. lata.—Corollae pars concreta 0·2 mm. longa; pars libera 5·6–7 mm. longa, 2–2·5 mm. lata.—Staminum alternipetalorum filamentorum pars concreta 0·2 mm. longa; pars libera 4–4·4 mm. longa, 0·4–0·45 mm. lata.—Staminum oppositipetalorum filamentorum pars concreta 0·4 mm. longa; pars libera 3–3·4 mm. longa, 0·35–0·4 mm. lata.—Antherae 0·9–1 mm. longae, 0·6–1 mm. latae.—Carpellorum pars concreta 0·9–1·2 mm. longa; pars libera 2·8–3 mm. longa.—Styli 1·2–1·4 mm. longi.—Squamae 0·5–0·55 mm. longae, 0·15–0·2 mm. latae.—Semina 0·5–0·55 mm. longa, 0·25 mm. lata.

China. Between Batang and Tachienlu, Sept.–Oct., 1904, *Hosie*.—Herb. Kew.

Obs.—*S. Mossii* a *S. Balfouri*, R. Hamet,* cui affinis: 1° foliis marginibus non ciliatis; 2° sepalis ovatis, et non longe deltoideis; 3° squamis latioribus.

Sedum Hobsonii, *Prain* mss.—*Planta* perennis, steriles caules non edens. *Radices* crassiusculae. *Caudex* erectus, crassus, simplex, glaber, caulibus vetulis et desiccatis cinctus, apice gemmulam evolutam, caules floriferos basi squamis cinctos, et caules floriferos desiccatos, ferens. *Gemmulae* evolutae externae deltoidei-subsemiorbiculares, a basi usque ad apicem attenuatae, apice in caudam brevem vel longiusculam, squama breviorem, linearem, subteretem, obtusiusculam, productae, longiores quam latiores. *Gemmulae* evolutae squamae internae petiolatae; petiolo lamina paulo longiore vel paulo breviore, in parte superiore plus minusve longa, late lineari, in parte inferiore dilatatissimo et deltoidei-subsemiorbiculari; lamina ovato-oblonga, marginibus integris, apice obtusiuscula, longiore quam latiore. *Gemmulae* evolutae squamae interiores longe petiolatae; petiolo lamina longiore, longiore quam latiore, lineari, in parte inferiore valde dilatato et deltoidei-subsemiorbiculari; lamina ovato-oblonga, marginibus integris, apice obtusiuscula, longiore quam latiore. *Caules* floriferi erecti, graciliusculi, simplices, glabri. *Folia* alterna, infra insertionem in calcar non producta, plana, glabra, ovata, marginibus integerrimis, longiora quam latiora, basi in pseudo-petiolum a lamina vix distinctum, latum, et lamina multo breviorem, contracta, apice obtusiuscula. *Inflorescentia* pauciflora, corymbiformis. *Bracteae* foliis similes. *Pedicelli*

* Hamet, in Plantae Chinenses Forrestianae, pp. 116 et 117, et tab. LXXXVI (1912).

glabri, calyce breviores. *Calyx* glaber, segmentis 5, tubo longioribus, basi in calcar non productis, deltoideis vel ovato-deltoideis, marginibus integerrimis, apice acutis, longioribus quam latioribus. *Corolla* glabra, calyce longior, segmentis 5, tubo multo longioribus subobovatis, basi leviter coartatis, in parte superiore usque ad apicem acutum et mucronatum attenuatis, mucrone petali extremitatem vix superante, marginibus integerrimis, longioribus quam latioribus. *Stamina* 10, glabra ; filamenta oppositipetala lineari-deltoidea, infra corollae medium inserta ; antherae corollae medium superantes et petalorum apicem subattingentes, longe reniformi-ovatae, apice cuspidatae, longiores quam latiores. *Carpella* 5, pauciovulata, glabra, in stylos carpellis breviores attenuata. *Squamae* 5, sublineari-teretes, apice obtusae vel emarginatae, longiores quam latiores. *Folliculi* pauciseminati, erecti, lateribus internis non gibbosis. *Semina* obovata, apice obtusissima, longiora quam latiora, testa e rugis in longitudinem dispositis prominulis instructa, et nucleum apice paulo superante.

Caudex 5 cm. longus, 1·5 mm. e diametro.—Gemmulae evolutae squamarum externarum lamina 2–2·4 mm. longa, 1·6 mm. lata ; cauda 1–1·6 mm. longa, 0·4 mm. lata.—Gemmulae evolutae squamarum internarum petiolus 3·2–4 mm. longus, 2–3 mm. latus ; lamina 2·4–4·4 mm. longa, 0·8–1·2 mm. lata.—Gemmulae evolutae squamarum interiorum petiolus ·86–1·5 cm. longus, 2·5–3·2 mm. basi latus, 0·6–1·2 mm. medio latus ; lamina . . . . . .— Caules floriferi 5·5–13·5 cm. longi.—Caulium floriferorum folia 6–7·6 mm. longa, 2–3·5 mm. lata.—Inflorescentia 0·7–3·5 cm. longa, 1·2–4·5 cm. lata.—Pedicelli 0·75 mm. longi.—Calycis pars concreta 0·8–1·3 mm. longa ; pars libera 3·6–5·2 mm. longa, 1·5–2·2 mm. lata.—Corollae pars concreta 0·2 mm. longa ; pars libera 6·6–8 mm. longa, 2–3 mm. lata.—Staminum alternipetalorum filamentorum pars concreta 0·2 mm. longa ; pars libera 5·2–6·3 mm. longa, 0·4–0·7 mm. lata.—Staminum oppositipetalorum filamentorum pars concreta 2–2·8 mm. longa ; pars libera 3·3–4 mm. longa, 0·4–0·6 mm. lata.—Antherae 0·9 mm. longae, 0·65 mm. latae.—Carpellorum pars concreta 1·4–1·9 mm. longa ; pars libera 3·3–3·6 mm. longa.—Styli 1·45–2 mm. longi.—Squamae 0·8–1 mm. longae, 0·45–0·6 mm. latae. Semina 0·8 mm. longa, 0·3 mm. lata.

Tibet. Yatung, *H. E. Hobson*.—Specimen authenticum ; Gupten-de-la, a little above Chumbi, *King*.—Gum-bo-teen, 2000 ft. above Chumbi, *Dungboo*.

Obs.—Haec species, quamvis *S. dumuloso*, Franchet,* *S. Liciae*, R. Hamet,† *S. linearifolio*, Royle,‡ valde affinis sit, distinctissima est. A *S. dumuloso* : 1° petalis apice mucronatis, mucrone petali extremitatem vix superante, marginibus integerrimis, et non apice aristatis, arista petali extremitatem longe superante, marginibus erosis ; 2° foliis ovatis, et non lineari-oblongis vel lineari-ovatis, differt.

De *S. Liciae* : 1° foliis ovatis, marginibus integerrimis, basi in pseudo-petiolum a lamina vix distinctum, latum, et lamina multo

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* Franchet, Plantae David., t. I, p. 129 (1884).

† Hamet, *Sedum Praini*, *S. Levii*, *S. Liciae*, in Bull. Soc. Bot. France, t. lvi—, pp. 568–570 (1909).

‡ Royle, Illustr. Bot. Himal., p. 222, tab. xlviii, fig. 1.

breviorem contractis, apice obtusiusculis, et non petiolatis, petiolo gracili, lamina orbiculari, crenata, apice obtusissima ; 2° caudice erecto, caulibus floriferis vetulis et desiccatis cincto, et non repente, nudo ; 3° petalis apice mucronatis, mucrone petali extremitatem vix superante, et non apice aristatis, arista petali apicem longe superante, discrepat.

A *S. linearifolio* : 1° caudice erecto, caulibus floriferis setulis et desiccatis cincto, et non repente, nudo ; 2° sepalis acutis, et non obtusis ; 3° petalis acutis, et non subobtusis, distat.

Denique ab his 3 speciebus gemmulae evolutae squamis foliiformibus, dissidet.

Sedum Stapfii, *R. Hamet* sp. nova.—*Planta* perennis, steriles caules non edens. *Tuberculum* (?) apice gemmulam et caulem floriferum ferens. *Gemmulae* squamae longe deltoideae, in parte inferiore dilatatae, apice acutae, longiores quam latiores. *Caules* floriferi erecti, circiter in medio foliorum verticillum ferentes, infra verticillum crassiusculi, nudi et simplices, supra verticillum graciles, nudi, simplices vel ramosi, quoque ramo a flore solitario terminato. *Folia* per 5 vel 6 verticillata, infra insertionem in calcar non producta, petiolata, glabra ; petiolo lamina breviore, late lineari, basi non dilatato, longiore quam latiore ; lamina ovata vel ovato-oblonga, marginibus integerrimis, apice obtusiuscula, longiore quam latiore. *Flores* ♀ : *Calyx* glaber, segmentis 5 tubo longioribus basi in calcar non productis lineari-deltoideis vel deltoideis basi dilatatis vel non dilatatis, apice obtusiusculis vel obtusis, marginibus integerrimis, longioribus quam latioribus. *Corolla* glabra, calyce paulo longior vel paulo brevior, tubo inconspicuo, segmentis 5, obovatis vel suborbicularibus, in parte inferiore coartatis et basi dilatatis, in parte superiore usque ad apicem subobtusiusculum attenuatis, marginibus erosis, longioribus quam latioribus. *Carpella* 5, glabra, in stylos crassiusculos, carpellis longiores, attenuata. *Squamae* 5, sublineares vel subquadratae, basi non dilatatae vel dilatatae, apice obtusissimae, paulo longiores quam latiores. *Folliculi* 5, erectiusculi, lateribus internis non gibbosis. *Semina* obovata, basi subacuta, apice obtusissima, paulo longiora quam latiora, testa laevi nucleum duabus extremitatibus non superante.

Gemmulae squamae 0·7–1 cm. longae, 2·3–4 mm. latae.—Caules 1·4–2·35 cm. longi.—Foliorum petiolus 2–3·5 mm. longus, 1·3–1·9 mm. latus ; lamina 8–9 mm. longa, 4–5·9 mm. lata.—Calycis pars concreta 0·9–1·25 mm. longa ; pars libera 2·5–3·5 mm. longa, 1·15–1·9 mm. lata.—Corollae pars concreta inconspicua ; pars libera 2·5–2·75 mm. longa, 1·4–1·7 mm. lata.—Carpellum pars concreta 0·8–1 mm. longa ; pars libera 2·8–3·2 mm longa.—Styli 0·9 mm. longi.—Squamae 0·6–0·85 mm. longae, 0·4–0·6 mm. latae.—Semina 0·85 mm. longa, 0·5 mm. lata.

TIBET. *King* 318.

Obs.—*S. Stapfii* a *S. Karpelesae*, R. Hamet,* *S. Levii*, R. Hamet† et *S. Praini*, R. Hamet,‡ quibus affinis, valde distincta est.

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* R. Hamet, Sur un nouveau *Sedum* du Tibet, in Bull. Soc. Bot. France, t. lviii, p. 615–617 (1911).

† R. Hamet, *Sedum Praini*, *S. Levii*, *S. Liciae*, in Bull. Soc. Bot. France, t. lvi, p. 567–568 (1909).

‡ R. Hamet, l. c., p. 565–567 (1909).

A *S. Karpelesae* : 1° gemmulae squamis non foliiformibus ; 2° foliis in solo verticillo aggregatis ; et non subverticillatis in caulis parte superiore ; 3° sepalis corolla paulo longioribus vel paulo brevioribus, et non corolla multo brevioribus ; 4° petalis marginibus erosis, et non integerrimis, differt.

De *S. Levii* : 1° gemmulae squamis non foliiformibus ; 2° foliis in solo verticillo aggregatis, et non alternis ; 3° sepalis lineari-deltoideis vel deltoideis, obtusiusculis vel obtusis, et non late ovatis, acutis ; 4° petalis marginibus erosis et non integris, discrepat.

A *S. Praini* : 1° foliis in solo verticillo aggregatis, et non in caulis parte superiore subverticillatis et alternis ; 2° caule unifloro vel ramis unifloris, et non caule ab inflorescentia corymbiformi terminato ; 3° sepalis lineari-deltoidei, vel deltoideis, obtusiusculis vel obtusis, et non ovatis, acutis ; 4° petalis marginibus erosis, et non integris, distat.

Denique ab his 3 speciebus dioecia abest.

Sedum Rendlei, *R. Hamet*, sp. nova.—*Planta* perennis. *Radices* crassiusculae. *Caudex* brevis, carnosulus, repens, apice suberectus, caulem floriferum basi squamis late semiorbicularibus obtusis cinctum, et squamarum ovatarum obtusiuscularum gemmulam apice ferens. *Caules* floriferi erecti ; graciles, simplices, glabri. *Folia* alterna, sessilia, infra insertionem in calcar non producta, glabra, oblonga vel oblongo-linearia, vel sublinearia, apice acutiuscula, marginibus integerrimis, longiora quam latiora. *Inflorescentia* flore solitario, vel floribus paucis (3–5) in pseudo-umbellam dispositis. *Bracteae* foliis similes. *Pedicelli* quam calyx breviores, glabri. *Calyx* glaber, segmentis 5 tubo longioribus infra insertionem in calcar non productis longissime deltoideis, marginibus integerrimis, apice acutiusculis, longioribus quam latioribus. *Corolla* glabra, calyce longior, segmentis 5 tubo multo longioribus latissime linearibus basi leviter coartatis, in parte superiore longe attenuatis usque ad apicem acutiusculum et longe aristatum, arista petali apicem superante, marginibus integerrimis in parte lineari fimbriatis in parte superiore attenuata, longioribus quam latioribus. *Stamina* 10 ; filamenta oppositipetala infra corollae medium inserta, gracilia, sublinearia ; antherae oppositipetalae anguste reniformes, apice breviter cuspidatae, longiores quam latiores, corollae medium superantes. *Carpella* 5, multiovulata, glabra, in stylos quam carpella breviores, attenuata. *Squamae* 5, late quadratae, marginibus integerrimis, apice obtusissimis raro emarginatis, latiores quam longiores. *Folliculi* 5, multiseminati, erecti ; lateribus internis non gibbosis. *Semina* oblonga, testa e rugis in longitudinem dispositis prominulis instructa, duabus extremitatibus nucleum vix superante.

Gemmulae squamae 2·9–4 mm. longae, 3·6–4·7 mm. latae.—Caules floriferi 6–8 cm. longi.—Folia 0·6–1 cm. longa, 0·9–1·45 mm. lata.—Inflorescentia 0·9–1·2 cm. longa, 1·1–2·3 cm. lata.—Pedicelli 1–2 mm. longi.—Calycis pars concreta 0·5–0·6 mm. longa ; pars libera 8·2–8·9 mm. longa, 1·2–1·5 mm. lata. Corollae pars concreta 0·5–0·6 mm. longa ; pars libera 8·2–8·9 mm. longa, 2·6–3 mm. lata.—Staminum alternipetalorum filamentorum pars concreta 0·5–0·6 mm. longa ; pars libera 5·2–5·4 mm. longa, 0·45–0·5 mm. lata.—

Staminum oppositipetalorum filamentorum pars concreta 3·2–3·6 mm. longa; pars libera 2·9–3·2 mm. longa, 0·3–0·37 mm. lata.—Antherae 0·8 mm. longae, 0·5 mm. latae.—Carpellorum pars concreta 1·2–1·25 mm. longa; pars libera 4·8–5 mm. longa.—Styli 1·2–1·5 mm. longi.—Squamae 1·2–1·5 mm. longae.—Semina 1–6 mm. longa, 0·5 mm. lata.

Western China, 12,500 ft.; base rocks, *E. H. Wilson* 3619 in Herb. Brit. Mus.

Obs.—Planta, supra descripta, a *S. linearifolio*, Royle,* *S. dumuloso*, Franchet,† *S. Liciae*, R. Hamet‡ et *S. Hobsonii*, Prain,§ quibus affinis est, facile discreta est.

De *S. linearifolio*, petalis acutiusculis, longe aristatis, et non obtusiusculis, vix mucronatis, discrepat.

A *S. dumuloso*: 1° caudice graciliore, repente, et non ascendente, caulibus vetulis cincto; 2° petalis magis fimbriatis, differt.

A *S. Liciae*: 1° foliis sessilibus, oblongis, vel oblongo-linearibus, vel linearibus, apice acutiusculis, marginibus integerrimis, et non petiolatis, lamina orbiculari, crenata, obtusissima; 2° petalis latissime linearibus, basi leviter coartatis, in parte superiore longe attenuatis, marginibus in parte superiore fimbriatis, et non ovato-lanceolatis, marginibus integris, distat.

A *S. Hobsonii*: 1° caudice repente, nudo, et non erecto, caulibus floriferis vetulis et desiccatis cincto; 2° foliis oblongis, vel oblongo-linearibus, vel linearibus, et non ovatis; 3° sepalis acutiusculis, et non acutis; 4° petalis marginibus fimbriatis, et non integerrimis, abest.

XXIV.—MISCELLANEOUS NOTES.

Mr. W. B. Hemsley. We note with pleasure that Mr. W. B. Hemsley, F.R.S., late Keeper of the Herbarium, Royal Botanic Gardens, Kew, has received the Honorary Degree of LL.D. from the University of Aberdeen. He has also been elected an Honorary Member of the New Zealand Institute.

Mr. J. Medley Wood. It gives us particular pleasure to record that Mr. J. Medley Wood, the veteran Director of the Natal Botanic Gardens, has had the Honorary Degree of D.Sc. conferred upon him by the University of the Cape of Good Hope.

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* Royle, Illustr. Bot. Himal., p. 222, tab. xlviii., fig. 1.
† Franchet, Plantae David., t. i., p. 129 (1884).
‡ Hamet, *Sedum Praini*, *S. Levii*, *S. Liciae*, in Bull. Soc. Bot. France, t. lvi., p. 568–570 (1909).
§ Prain, ex Hamet, cfr. supra.

A New Rot of Potato Tubers.—A new disease of potatoes, which was notified from Ireland last year, has now been described in detail by Dr. G. H. Pethybridge.* It was first observed in 1909 in the plots of the temporary experiment station, established by the Irish Department of Agriculture, at Clifden, Co. Galway. Since then it has been kept under observation, and has also been received from other parts of Ireland. The rotting is found to be due to a fungus closely allied to *Phytophthora infestans*, but differing in certain essential particulars. The fungus is named *P. erythroseptica*, and for the disease the name "Pink Rot" is suggested, owing to the cut surfaces of affected tubers quickly turning pink when exposed to the air.

The facilities afforded by the Clifden station give Dr. Pethybridge exceptional opportunities for studying potato diseases, and in the opening part of his paper he briefly but critically reviews the principal forms of tuber-destruction caused by vegetable organisms. The potato tuber is a structure on which, when once it has been injured, a most varied micro-flora and fauna readily develope, hence the diagnosis of the cause of decay is exceptionally difficult.

Pink Rot commences when the potatoes are still in the ground, and has been found in some varieties as early as July. In most cases the attack begins at the "heel" end of the tuber, and proceeds rather quickly towards the distal or "rose" end. Diseased tubers remain firm, but if pressed exude a quantity of juice, and finally become completely rotten. They do not, however, develop cavities, as in the case of Black Stalk Rot caused by *Bacillus melanogenes*. If the tubers are exposed to the air, the subsequent stages resemble those of a "dry" rot; but if covered, the moisture which is exuded does not dry up, so that in the field or store the rot would be regarded as of the "wet" type. A characteristic series of colour-changes takes place when affected tubers are cut open and exposed to the air. The pink colour begins to show after a few minutes, and within half an hour the whole of the diseased portion becomes a deep salmon-pink. With an exposure of several hours the cut surface gradually darkens, and becomes purplish-brown or nearly black. As pointed out above a number of other fungi develop on such decaying tubers, and pustules of various kinds, including those of Fusarium, break through the skin. The latter are merely secondary, the organism causing the initial injury being entirely internal.

Examined with the microscope diseased tissues show an abundance of rather wide, much branched, intercellular hyphae. No haustoria were observed, and no reproductive organs of any sort could be discovered.

With suitable precautions the fungus was isolated without difficulty, it being found to grow more easily on artificial media than its ally *P. infestans*. A full account of the culture media and methods is given, and also of the experiments which prove the pathogenic character of the fungus. Reproductive organs were produced abundantly in artificial cultures, though strong predilections for

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* On the Rotting of Potato Tubers by a New Species of Phytophthora having a Method of Sexual Reproduction hitherto undescribed. Sci. Proc. Roy. Dubl. Soc., vol. xiii, no. 35, March, 1913.

certain substrata were shown. Growth on various media derived from oats was specially vigorous, and an abundant crop of sexual organs follows, from which oospores develope. An acid medium appears to be unfavourable for the production of antheridia and oogonia. Conidia were produced when pieces of culture were transplanted to sterilised peat-bog water or even rain-water; these structures are apparently only developed under water and very rarely if ever on aerial mycelium.

The method of development of the apparently sexually produced oospores is remarkable and unique amongst fungi. The oogonium incept enters the antheridium at or near its base, grows up through it and out at the top, expanding there to form the oogonium proper in which the oospore develops. Cytological details are not yet available. At the end of the paper other species of the same genus are shown to behave in a similar manner, and some systematic alterations based on this discovery are proposed.

Phytophthora erythroseptica is prevalent in the West of Ireland, and the losses caused by it are considerable, in some cases heavier than those due to *P. infestans*. They are greatest in crops grown continuously on the same land (infection taking place from the soil) and can be avoided by proper rotation.

A.D.C.

Salacia Livingstonii.—Under this name Dr. Th. Loesener has described a specimen in the Stockholm Herbarium labelled "Livingstone's S. African Exp. 14–19 S. Lat. Coll. Dr. J. Kirk." Whilst arranging the African material of *Salacia* at Kew in accordance with Loesener's revision, it was found the description of *S. Livingstonii* fitted the type specimen of *S. pyriformis*, var. *obtusa*, Oliv., which was collected by Kirk on Livingstone's expedition, and which had not been seen by Loesener. The synonymy and distribution of the species are as follows:—

Salacia Livingstonii, *Loes.* in Engl. Jahrb. vol. xliv. p. 178 (1910). *S. pyriformis*, var. *obtusa*, Oliv. Fl. Trop. Afr. vol. i. p. 375 (1868).

Portuguese East Africa. Lower Zambesi: Shupanga, *Kirk*. Shire River: Shamo, *Kirk*.

T. A. S.

Botanical Magazine for March.—The plants figured are *Cytisus Dallimorei*, Rolfe (t. 8482); *Magnolia salicifolia*, Maxim. (t. 8483); *Aloe Marlothii*, Berger (t. 8484); *Ruellia Harveyana*, Stapf (t. 8485); and *Prunus pennsylvanica*, Linn. f. (t. 8486).

Cytisus Dallimorei is a garden hybrid obtained at Kew by crossing the well-known *C. scoparius*, Link, var. *Andreanus*, Hort. with *C. albus*, Linn., the former being the seed-bearer, and it is interesting that this exceedingly attractive plant is the first artificial hybrid obtained in the genus. Its flowers which are produced with great freedom are coloured with various shades of rosy-purple, thus differing markedly from those of both parents. Only two seedlings were raised from the original cross and in one of these the flowers were yellow. A seedling obtained from the yellow-flowered plant has cream-coloured flowers touched with rose.

The *Magnolia* is a Japanese species distinguished among the species in cultivation by its slender twigs and thin narrow leaves. Its flowers resemble those of *M. stellata*, Maxim. in which, however, all the segments of the perianth are petaloid, while in *M. salicifolia* there is a distinct calyx of three greenish-white sepals. The plant from which the material for the figure was obtained is one of a number purchased for Kew from a Japanese nursery in 1906.

Aloe Marlothii, recorded from Bechuanaland, Natal and the Transvaal, proves to be identical with a plant which had previously been named *A. supralaevis*, β *Hanburii*, Baker, from material received from the late Sir Thomas Hanbury's garden at La Mortola, where also the plant which furnished the specimen figured is in cultivation. The affinities of *A. Marlothii* are with *A. Galpinii*, Baker, from which it may be distinguished by the leaves being spiny-tuberculate beneath, and by the yellow, not red, somewhat longer secund flowers.

Ruellia Harveyana is a new species which was discovered by Mr. J. C. Harvey of Sanborn, Vera Cruz, in forests on the Atlantic side of the Isthmus of Tehuantepec, Mexico, in 1904. The plate was prepared from a plant which was received from Mr. Harvey in 1911 and which flowered in August, 1912. It has petiolate oblong or elliptic-oblong leaves, 2–3 inches long, and rather large pale lilac sessile flowers, produced one at a time in the upper axils. It is most nearly allied to *R. lactea*, Cav.

The *Prunus* is an old but still not familiar species in English gardens. A small tree presented to Kew by the Arnold Arboretum in 1910 has flowered very freely, and it is suggested that the species would be worth a place in thin woodland where *P. avium* and *P. Padus* succeed. *P. pennsylvanica* is widely distributed in North America, ranging from Newfoundland and the shores of Hudson's Bay in the north to North Carolina and Tennessee in the south, and westward to the inland slopes of the Rocky Mountains.

Botanical Magazine for April.—The plants figured are *Sansevieria aethiopica*, Thunb. (t. 8487); *Pyrus ionensis*, L. H. Bailey (t. 8488); *Cocculus trilobus*, DC. (t. 8489); *Cistus Loreti*, Rouy. & Fouc. (t. 8490); and *Hypericum Kalmianum*, Linn. (t. 8491).

The *Sansevieria*, a species widely distributed in South Africa, has been known in European gardens for upwards of a century, but, owing to its having been mistaken for *S. zeylanica*, Willd., it has not previously been figured under its correct name. The plant from which the material for the figure was obtained was sent to Kew in 1895 by Mr. C. Howlett, Curator of the Botanic Garden at Graaf Reinet. With regard to *S. zeylanica* it is of considerable interest that wild specimens have recently been received at Kew from Ceylon and prove that the species is quite distinct from that usually known by the name.

Pyrus ionensis is the Common Crab of the Mississippi basin and belongs to a small group which includes the closely allied *P. coronaria*, Linn., distinguishable from the species now figured by having its leaves truncate or slightly cordate, and, when mature, nearly or quite glabrous. *P. ionensis*, like *P. coronaria* and

P. angustifolia, Ait., is remarkable in having violet-scented flowers. A double-flowered form of *P. ionensis* is often met with in gardens usually either as *P. angustifolia, flore pleno* or as *P. coronaria, flore pleno.*

Cocculus trilobus was introduced to cultivation from Japan about twenty years ago by Professor Sargent of the Arnold Arboretum. It is a hardy scandent shrub with insignificant flowers but rather attractive bunches of small blue-black fruits. The species ranges frrom Japan and Northern China to the Philippines.

Cistus Loreti is a hybrid between *C. ladaniferus*, Linn. and *C. monspeliensis*, Linn., which has been found in a wild state in Hérault, growing with the two species named, and has since been obtained artificially by the late Dr. Bornet. It has been grown at Kew for a quarter of a century and has proved of great value owing to its hardiness.

The pretty *Hypericum Kalmianum* was originally introduced into this country in 1759, but it appears for some years past to have been lost to gardens, the plant commonly grown under its name being *H. prolificum*, Linn. Seeds of *H. Kalmianum*, which is a native of the Great Lake region of North-Eastern America, were received at Kew in March, 1911, from Mr. J. Dunbar, the Assistant Superintendent of the Rochester Parks, N.Y. The figure was prepared from a plant, raised from these seeds, which flowered in August, 1912.

Agricultural Chemistry.*—The issue of the 3rd edition of this admirable work (the 1st appeared in 1902) affords a gratifying evidence that the scientific and theoretical aspect of agriculture is becoming a matter of more general study among those concerned. We know no work better calculated than this to give the student of advanced agriculture a thorough appreciation of the underlying principles that should govern the management of crops, the application of manures, the respective values of different foods for farm animals, and farm-work generally. It is on chemical change that agriculture has its ultimate foundation, and it is on its control and most beneficial adaptation to his own purposes that the success of the farmer depends. The work opens with a description of the more important elements, gaseous and solid, and a general discussion on their connection with plant and animal life. The atmosphere and soil are then dealt with, leading up to a study of plant structure and physiology, crops and manures. The second part of the work is largely devoted to agricultural animals, their foods and feeding, milk and milk products.

Mr. Ingle's book is one of great value and interest and should be in the hands of all who desire a deeper knowledge of the workings of plant and animal life in relation to what is still the most important of all industries. It brings together a remarkable assemblage of facts of the highest importance to farmers stated in clear, concise language intelligible to persons of average education.

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* Manual of Agricultural Chemistry. By Herbert Ingle, B.Sc. (Leeds) etc. London. Scott, Greenwood & Son, pp. 397; 16 illustrations; price 7*s.* 6*d.* net. 3rd edition , 1913.

CORYLUS JACQUEMONTII.

To face page 163.]

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 5.] [1913.

XXV.—GARDEN NOTES ON NEW TREES AND SHRUBS.

(With Plates.)

W. J. Bean.

XII.—A Himalayan Tree Hazel.

Corylus Jacquemontii, *Decaisne.* (*C. lacera*, Wallich, cat. No. 2798) [Corylaceae].

Owing no doubt to the great heat of the summer of 1911 and the consequent thorough ripening of the wood, the crop of hazel nuts at Kew in the autumn of 1912 was very abundant. Several trees that had never before borne fruit did so then. Amongst them was a tree received in 1898 from Messrs. Van Geert as *Corylus Colurna*. The fruit of this proved it to be the interesting tree found wild in N.W. India (Cashmere, &c.), named *C. Jacquemontii* by Decaisne and previously *C. lacera* by Wallich. Wallich's name, however, was never published, whilst Decaisne gave a full description and figure in Jacquemont, Voyage dans l'Inde, p. 160, t. 160.

C. Jacquemontii is undoubtedly very closely allied to *C. Colurna* and J. D. Hooker in the Flora of British India, vol. v., p. 625, sinks it under that species without distinguishing it as a variety, although from a note on the cover he appears to have contemplated doing so. It is distinct from the *C. Colurna* of Asia Minor, Greece and Hungary, as is shown by the drawing published herewith. The leaves are larger, being often over 6 inches long, sometimes 8 inches, and as much as 5 inches wide; the blade is not so rounded as in *C. Colurna* and more strictly obovate, the margins too are more conspicuously lobed towards the apex, the lobes more acuminate and sharply toothed. The most distinctive feature, however, is the involucre of the fruit. In *C. Colurna* this is covered densely with gland-tipped bristles, especially on the subulate lobes, which give the whole often quite a mossy aspect;

(29866—6a.) Wt. 212—780. 1125. 7/13. D & S.

in *C. Jacquemontii* the involucre is merely pubescent, the glandular bristles being absent, or few and scattered. The tree appears to be quite hardy and a vigorous grower; it breaks earlier into growth in spring than the Asia Minor tree.

In the *Kew Bulletin* for 1911, p. 327, there is a notice of the new Chinese form of *Corylus Colurna* (var. *chinensis*, Burkill; *C. chinensis*, Franchet), also a very promising hardy tree.

XIII.—New Chinese Species.

Alnus cremastogyne, *Burkill* [Betulaceae].

Judging by the photographs made by Mr. Wilson of this alder as it is found in a wild state in Western China, it forms a slender tree sometimes 80 to 100 feet high, of elegant appearance. Its leaves are obovate or oval, $2\frac{1}{2}$ to $5\frac{1}{2}$ inches long, $1\frac{1}{2}$ to 3 inches wide, broadly cuneate or rounded at the base, acute or cuspidate at the apex, unevenly serrate, dark glossy green and glabrous above, with tufts of brown hairs in the vein-axils beneath; petiole $\frac{1}{4}$ to $\frac{1}{2}$ inch long. The female strobiles are very distinct from those of other cultivated alders in being solitary on slender peduncles $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long; they are ovoid, $\frac{3}{4}$ inch long, $\frac{1}{3}$ inch wide, each seed having a thin, broad wing. Should the species prove hardy, as at present appears probable, its graceful aspect and distinct character will make a welcome addition to trees for damp spots in this country. It was discovered by Henry in Szechuen in 1899 and introduced by Wilson ten years later. The plants at Kew were raised from seed collected by him during his third journey.

Closely allied to it, perhaps no more than a variety, is *A. lanata*, Duthie, also introduced by Wilson. It has the same strobiles as *A. cremastogyne*, but is well marked by the dense covering of brown wool on the branchlets, petioles and peduncles, and on the underside of the leaves. No male catkins of *A. cremastogyne* are preserved at Kew, but in *A. lanata* they are slender and 2 to 3 inches long.

Berberis candidula, *C. K. Schneider* (*B. Wallichiana pallida*? Vilmorin in Frutic. Vilm. p. 15; *B. Wallichiana* var. *hypoleuca*, *Hort.*) [Berberidaceae].

Mr. Maurice de Vilmorin, in the work just cited, informs us that this charming little barberry was raised by him from seeds received from Père Farges in 1895. It has some points of resemblance to *B. Hookeri* (the *B. Wallichiana* of gardens), but certainly deserves the specific rank given it by Schneider. It is a dwarf evergreen bush of close neat habit, its branchlets stiff, spreading, and formidably armed with triple spines $\frac{1}{2}$ to $\frac{3}{4}$ inch long. Leaves $\frac{3}{4}$ to 1 inch long, $\frac{1}{8}$ to $\frac{1}{4}$ inch wide, lanceolate or linear, black polished green and smooth above, blue-white beneath, spine tipped, the larger leaves armed with one to three spiny teeth on each margin. Flowers rich golden-yellow, mostly solitary from the axils of the leaf, rather globose. Fruit black covered with blue bloom.

In gardens this new barberry will prove useful for the rock garden, being slow-growing, evergreen, and of dainty habit.

Cladrastis sinensis, *Hemsley* [Leguminosae].

If, as most authors now agree in doing, we exclude from *Cladrastis* the old genus *Maackia*, united to it by Bentham and

ALNUS CREMASTOGYNE.

[*To face page* 164.

CLADRASTIS SINENSIS.

Hooker, *C. sinensis* affords another instance of that curious isolation of a species in N.E. Asia whilst the only other known species (in this case *C. tinctoria*, the yellow wood) occurs in Eastern North America. Of this phenomenon we have examples in the two species respectively of *Sassafras*, tulip tree, *Chionanthus* and of *Gymnocladus*. That *C. sinensis* is a true *Cladrastis* as distinct from *Maachia* is shown by the leaf-buds being quite concealed by the base of the petiole and by the brittle nature of the twigs.

It is a deciduous tree 50 feet or more in height, the branchlets rusty pubescent at the base. Leaves pinnate, consisting of 11 to 17 leaflets which are oblong or ovate, 1½ to 3 inches long in cultivated trees, but up to 5 inches long and 1½ inches wide in wild specimens, pointed at the apex, cuneate or rounded at the base, dark green and smooth above, rather glaucous and pubescent on the midrib beneath; rachis and the short petiolule also pubescent. Flowers (not yet seen in gardens) blush-white, fragrant, papilionaceous, ½ inch long, borne in erect pyramidal panicles as much as 12 inches long and 9 inches wide. Calyx pubescent. Seed-pod flattened, smooth, 2 to 3 inches long, ½ inch wide.

This interesting and handsome tree appears, judging by plants at Coombe Wood and Kew, to be quite hardy. It was originally discovered by Mr. E. A. Pratt in 1890 in Szechuen, but was not introduced until 1901, when Mr. Wilson sent it home to Messrs. Veitch, to whom Kew is indebted for plants now in the collection.

Diospyros armata, *Hemsley* [Ebenaceae].

We have already in cultivation two perfectly hardy species of *Diospyros*, viz., *D. Lotus* and *D. virginiana*, and a third (*D. Kaki*) that is nearly so, for although it suffers in the open, it grows well and bears fruit on a wall. *D. armata* is an interesting addition for which we have to thank Messrs. Veitch, who have lately enabled us to add it to the Kew collection. It was originally discovered by Henry in Central China and introduced by Wilson in 1904, since when it has been grown in the Coombe Wood Nursery, and is, so far as can at present be judged, entirely hardy.

It is a deciduous shrub of very sturdy habit and slow-growing, but is described as sometimes becoming 20 feet in height; the branchlets are clothed with a close minute pubescence for the first two seasons and are occasionally terminated by a spine. Leaves oval or inclined to obovate, cuneate at the base, obtuse or rounded at the apex; 1 to 2½ inches long, ½ to 1¼ inches wide; dark green and glossy above, and glabrous on both surfaces except for pubescence on the midrib above and below. The blade is dotted with minute transparent glands; petiole ⅛ inch or less long, pubescent. Flowers unknown. Fruit globose, ¾ inch in diameter, borne on a stalk ½ inch in length, the calyx (whose four ovate lobes are ½ inch long) persisting at the base.

Mr. Hemsley described the foliage as persistent (Journ. Linn. Soc., xxvi., p. 69), but the Kew plant is quite deciduous, nor, on the solitary specimen in the Herbarium, are there any leaves except what are borne on the shoots of the year.

Enkianthus chinensis, *Franchet* [Ericaceae].

Mr. J. C. Williams of Caerhays Castle, has recently presented to Kew one of the very few examples of this *Enkianthus* at present

in cultivation. The species was originally discovered by Delavay in Yunnan, but was introduced to cultivation about 1901 by Wilson, who found it in W. Hupeh. It is a deciduous shrub 6 to 15 feet high with grey, smooth branchlets bearing the leaves in a cluster at the end. The leaves are mostly oval but vary more or less towards ovate and obovate, 1 to 2½ inches long, ½ to 1½ inches wide, tapering towards both ends, the margin set with minute, regular, incurved teeth; both surfaces glabrous; petiole ¼ to ½ inch long. The flowers appear in June, when the leaves are already fully-grown, borne on pendulous, corymbose racemes 1½ to 3 inches long, each flower on a slender, glabrous peduncle ½ to 1 inch long. Corolla campanulate, about ⅓ inch wide and long, salmon pink with deeper red lines, the 5 lobes rounded, shallow. Sepals ovate-lanceolate, glabrous, ⅛ inch long. Fruit a dry, 5-celled, subglobose capsule ¼ inch in length traversed lengthwise by 5 acute ridges.

This species is most nearly allied to *E. himalaicus*, Hook. f. and Thoms., which is, however, well distinguished by the bristly midrib (beneath) and petiole.

Meliosma Oldhami, *Miquel* [Sabiaceae].

Richard Oldham, the Kew collector, appears to have been the first to discover this species, which he did in 1863, in the Corean Archipelago. More than twenty years later Henry found it in Hupeh, and Farges in Szechuen. Wilson introduced it to the Coombe Wood nursery, whence Messrs. Veitch have kindly presented a plant to Kew. It belongs to the pinnate-leaved section of the genus and like its ally, *M. Veitchiorum*, Hemsl. and Wilson, (see *K.B.*, 1910, p. 173) is somewhat thin in branching.

A deciduous tree 50 feet high with pinnate leaves 7 to 15 inches long; leaflets 5 to 11, the terminal ones the largest; the lower ones ovate and rounded at the base, middle ones oval, terminal ones obovate and more or less cuneate at the base; all are acuminate at the apex and have small slender teeth except towards the base; there are scattered minute bristles on both surfaces and tufts of down in the vein-axils beneath; they vary in size from 1 inch long and ¾ inch wide (the lower ovate ones) to 5½ inches long and 2 inches wide (the terminal obovate ones). The inflorescence is composed of a terminal panicle supplemented by smaller panicles in the axils of the upper leaves, the whole being 8 to 10 inches wide and high. The flowers are very small (⅙ inch diameter), very numerous, probably creamy white and fragrant; peduncles and pedicels pubescent.

Osmanthus armatus, *Diels* [Oleaceae].

At present the genus *Osmanthus* is not strongly represented in the out-door garden. But to the long cultivated *O. Aquifolium* and the hybrid *O. Fortunei* (see *Kew Bulletin*, 1911, p. 177), two species have recently been added from China. One of them, *O. Delavayi*, has already been described in these notes (*K.B.*, 1910, p. 393). The present species, *O. armatus*, is very distinct from any of the above. It is an evergreen shrub or small tree up to 15 ft. high, the young shoots at first minutely downy, ultimately greyish white. Leaves hard in texture, oblong-lanceolate or narrowly oval, 3 to 6 inches long, pointed, subcordate at the base or rounded to a short, purplish petiole; margins armed with large,

unequal, triangular, spine-tipped teeth, dark dull green, prominently net-veined and glabrous on both surfaces. It flowers in autumn like *O. Aquifolium*, producing the blossoms in fascicles from the leaf-axils; they are creamy white, ¼ inch wide, and fragrant, solitary on a slender peduncle ¼ inch in length. The fruit is described as violet-black, ovoid and ¾ inch long.

All the plants in cultivation appear to have been raised from a single plant brought home in 1902 by Wilson from Western Hupeh, throughout the woods of which area the species is sparingly scattered. The collector describes it as inhabiting cliffs and humus-clad boulders either in shade or fully exposed. It has lately been obtained for the Kew collection from Messrs. Veitch. In the adult state the leaves are less formidably toothed and are even entire. It is apparently quite hardy.

Salix Bockii, *Seemen* [Salicaceae].

This is a pleasing dwarf willow of spreading habit and growing only 3 or 4 feet high, densely branched and very leafy. The slender young branchlets are covered with silky grey down and bear the leaves at intervals of ⅛ to ¼ inch. The leaves are oblong or oval, ¼ to ½ inch long, rounded at the base, mucronate at the apex, dark green and glabrescent above, silvery beneath with silky appressed hairs. The flowers open in October and November before the fall of the leaf, and the plant, especially the male, is very pretty then. The catkins are 1 to 2 inches long, each male flower having two stamens whose filaments are united by the whole or nearly the whole of their length, the bracts narrowly lanceolate and obtuse.

Salix Bockii was introduced by Wilson to the Arnold Arboretum, to which institution Kew is indebted for plants. Mr. Wilson found it in the Yang-tze Kiang valley on the margins of streams where it is often submerged during the high water season. He says it flowers there also in late autumn, and he regards it as one of the most ornamental of dwarf willows.

Salix magnifica, *Hemsley* [Salicaceae].

No more remarkable tree or shrub has been introduced from China than this. It is quite distinct among willows, to not one of which in cultivation does it bear any resemblance in leaf. It is a deciduous shrub up to 20 feet high, quite glabrous in leaf and branch; young shoots purple at first, assuming a reddish hue later. The leaves are the most remarkable part of the plant. They are oval or slightly obovate, sometimes ovate, entire, rounded or slightly cordate at the base, cuspidate at the apex, dull greyish green (with a bloom) above, pale and slightly glaucous beneath. In our young living plants they have not yet become more than 6 inches long by about 4 inches wide, but in the herbarium of the Arnold Arboretum the largest leaves on specimens collected by Wilson in China measure 8¼ inches long by 5¼ inches in width, the petiole 2 inches long. Male catkins 4 to 7 inches long; stamens 2, four times as long as the scale. Female catkins longer, sometimes as much as 11 inches.

Mr. Wilson, who discovered the species, informs me that it is very common in parts of Western Szechuen between 7000 and 10,000 feet. He also says the young shoots change to red the

first winter and remain that colour for several years. The leaves assume a golden hue before they fall. It was introduced by means of cuttings and living plants to the Arnold Arboretum in 1909, and thence to Kew the following year.

Explanation of Plates.

I. *Corylus Jacquemontii*, Decaisne. Twig with fruit ripened at Kew.

II. *Alnus cremastogyne*, Burkill. Tree 80 ft. high, 6 ft. in girth of trunk. Tartar City, Chentu. E. Szechuen, 1700 ft. Aug. 22, 1908.

III. *Cladrastis sinensis*, Hemsley. Young tree, 25 ft. high, 2 ft. in girth of trunk. Foot of Wa-shan. W. Szechuen, 5600 ft. Sept. 19, 1908.

We are indebted to Prof. C. S. Sargent for permission to use Mr. Wilson's photographs.

XXVI.—COFFEE DISEASE IN EAST AFRICA.

The recent recognition in Uganda of the coffee disease caused by *Hemileia vastatrix*, Berk. et Br. has necessitated a re-examination of the *Hemileia* material which has reached Kew from time to time from Tropical East Africa. Careful comparison of that material with type specimens of both *Hemileia vastatrix* and *H. Woodii*, Kalchbr. and Cke., has also been necessary. We are indebted to Prof. Engler for the loan of herbarium specimens of *H. Woodii* and of species of *Coffea* for comparison with the material preserved at Kew.

The first intimation that coffee disease was prevalent in Uganda reached Kew in December of last year when some badly diseased coffee leaves were received from the Government Entomologist, Uganda, but it seems clear from information since received that the disease has not suddenly appeared but has been present in the country for some time. In fact, according to a recent report by the Director of Agriculture 'native coffee leaf disease' has been well known to old residents who were under the impression that *H. vastatrix* was not the fungus in this case.

The fungus was first recorded for Tropical Africa in 1894 on cultivated coffee received from German East Africa. According to Sadebeck,* however, *Hemileia vastatrix* was found by him on leaves of *Coffea arabica* in a collection of plants made by Fischer in German East Africa in 1885.

The exact locality for the specimen was not recorded but it was believed to have been collected in the Victoria Nyanza region.

Stuhlmann in 1897† also found *H. vastatrix* in this region on leaves of a coffee which was described by Froehner as *C. arabica* var. *Stuhlmanii*.

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* Sadebeck: "Die wichtigeren Nutzpflanzen u. deren Erzeugnisse aus den deutsch. Colonien. (3 Beih. z. Jahrb. der Hamb. Wiss. Anst. xiv. 1896, p. 93).

† Hennings Zeitschr. für Trop. Landw. 1897, i, p. 192.

These records support the view that the fungus may be endemic in Africa and may not necessarily have been introduced with imported coffee.

With regard to British East Africa *Hemileia* was first recorded in 1904 on coffee leaves from Buru* where coffee cultivation was first started in 1895. The disease is now widely spread in the Protectorate and in German East Africa and Uganda, but as yet there is no record of its occurrence in Nyasaland or in any part of the West Coast of Africa.

Coffee cultivated in plantations and the so-called 'wild coffee' are equally attacked by *Hemileia vastatrix*. The indigenous or wild coffee trees, according to the Report of the Director of Agriculture, "are scattered throughout the Buganda Kingdom in small lots of about 5 to 10 trees which receive practically no attention beyond picking the fruit when ripe."

He adds that "all the indigenous coffee, as far as can be ascertained, is covered with *H. vastatrix*."

It also appears that though so much attacked by the disease the native trees are not seriously affected by it, a fact which lends further support to the view that we may be concerned with an endemic rather than with an introduced disease.†

With regard to this so-called 'wild coffee' of Eastern Africa a good deal of confusion has arisen since it has been wrongly assumed, partly in connection with the publication of Hennings'‡ note of the occurrence of *Hemileia Woodii* on leaves of *Coffea Ibo*, that the wild or native coffee of Uganda should be referred to that species.

The history of the coffees grown in Uganda is as follows :—

The occurrence of coffee in Uganda is first mentioned by Speke in his Nile Journal, Appendix p. 636, where he states that coffee "M'wanee" is "cultivated in considerable quantities on and about the equator. The trees grow 10–12 ft. high, their boughing branches affording shade."

Stuhlmann in his account of the Uganda people in Emin Pasha's African Expedition p. 179, states that nearly every native banana plantation has its solitary coffee tree.

He also expresses the opinion (p. 720) that the coffee plants of the banana groves of Bukoba, on the German East African border of Uganda appear to be indigenous, at least not introduced by either Arabs or Europeans. The coffee referred to in this paragraph is undoubtedly the "Bukoba" coffee which was later described by Froehner as *Coffea arabica* var. *Stuhlmannii*, and which, from the examination of the type kindly lent to Kew by Prof. Engler, appears to be little more than a form of *C. robusta*, Linden. This variety was afterwards raised to specific rank by Zimmermann as *C. bukobensis*.

According to Sir Harry Johnston, (Uganda Proctectorate vol. i, p. 288) the coffee plant "whether originally introduced or not from

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* Dept. Agric. Leaflet, B. E. Africa, No. 10. Crop diseases reported 1904–05.

† The virulence of the attack by *Hemileia vastatrix* in Ceylon may possibly be explained on the assumption that the disease was not native to the country but was introduced to the island from Africa and that the fungus under the new conditions rapidly spread and assumed epidemic proportions.

‡ Hennings Zeitschr. für Trop. Landw. 1897, i, p. 192.

Abyssinia is at any rate native now in a semi-wild form to the better forested regions of the Uganda Protectorate, its berries producing coffee of excellent flavour."

Again in vol. ii. p. 674, speaking of the Bantu people, Sir Harry says that the coffee tree is probably indigenous to the forests of Uganda and the neighbouring islands in Lake Victoria.

In 1902 J. Mahon communicated to Kew dried specimens of "the common coffee of the country, collected from bushes 20 ft. high in a deserted native garden," and other specimens grown in the Entebbe Botanic Gardens from a seedling sent from Kew in 1901. These plants are practically identical, except that the ones from the native garden have smaller leaves, as might be expected from a neglected bush, and may without doubt be referred to *C. robusta*, Linden.

It seems clear therefore that the wild coffee of Uganda which is found in native gardens and plantations is *Coffea robusta*, Linden, a species which as De Wildeman has already suggested may be merely a variety or local race of *C. canephora*, Pierre, which was originally described from specimens from the Gaboon.

To sum up therefore we have the following synonymy:

Coffea arabica, var. *Stuhlmannii*, Froehner = *C. bukobensis*, Zimmermann = *C. robusta*, Linden = *C. canephora*, Pierre, forma.

The examination of the type specimen of *Hemileia Woodii* on leaves of supposed *Coffea Ibo* collected by Perrot near Lindi in German East Africa,* has revealed the fact that the diseased leaves do not belong to that species and in fact do not belong to any species of coffee known at Kew.

Further it seems highly improbable that the fungus on these leaves is anything but *Hemileia vastatrix*. The fungus is in a very advanced state, the pustules consisting almost entirely of germinated teleutospores, which do not differ in *H. vastatrix* and *H. Woodii* in dried specimens. A few uredospores are present, however, and these are of the *vastatrix* type, having the warted convex side sharply marked off from the smooth flattened side by a ring of strong teeth. It would appear, therefore, that the plant is really an unusually advanced state of *H. vastatrix*. Teleutospores are as a rule rare in this species, and are formed after the uredospores, whereas in *H. Woodii* both forms of spore are usually found intermixed. Hennings makes no mention of these teleutospores, although at that time they had not been described for *H. Woodii*, and he therefore probably regarded them, as did Kalchbrenner and Cooke originally, as "triangular cystidia" or paraphyses, and upon these based his determination of the fungus.

The chief result of the examination of the various type specimens is therefore the establishment of the fact that there is no record of coffee being attacked by any species of *Hemileia* other than *H. vastatrix*.

Neither *H. vastatrix* nor *H. Woodii* confines its attacks to any one genus of *Rubiaceae*. At Kew *H. vastatrix* is represented only on species of *Coffea*, though there are records of its occurrence

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* Hennings Zeitschr. für Tr. Landw. i, 1897, p. 192, *Kew Bull.*, 1906, p. 39.

on other genera (see *K.B.* 1906, pp. 38, 39). *H. Woodii* is known to occur on various species of *Vangueria*, on *Fadogia latifolia* and also on *Gardenia edulis* from Australia.

Another fungus, *Hemileia helvola*, Syd., found on Rubiaceous plants in the Congo, as well as *H. Woodii* might under certain conditions become adapted to coffees, but though this possibility should not be disregarded there is at present no evidence of the likelihood of such an eventuality.

XXVII.—MINOR AGRICULTURAL INDUSTRIES.*

II. The Culture of Early Flowers in Cornwall and the Scilly Islands.

W. Dallimore.

In various parts of Cornwall and the Scilly Islands a large business is carried on in the production of early flowers, more particularly Narcissi, for the English markets, and as the industry is one about which information is often sought, visits were paid to some of the principal growing centres during the third week of March for the purpose of enquiring into the conditions under which the flowers are grown and marketed, the knowledge thus obtained being summarised in the accompanying notes.

The bulb industry had its inception about 30 years ago, the object in view being the provision of a supplementary farm crop for agriculturists who had previously depended to a great extent upon the production of broccoli and early potatoes. For several years the work was largely of an experimental nature and only affected a few people but it is now included as a necessary and regular part of the routine of many arable farms and small holdings, and farmers and cottagers alike derive a certain portion of their income from the sale of flowers and bulbs.

All of the five of the Scilly Islands that are inhabited are equally interested in the industry, viz., St. Marys, Tresco, St. Agnes, St. Martins, and Bryher. On the Mainland, the neighbourhood of Penzance is the centre of the industry, although there are growers in the vicinity of Falmouth and elsewhere. Farmers thereabouts are handicapped by the long distance which separates them from important markets, hence, to recuperate themselves for losses due to heavy railway rates and packing, they rely upon the extra profit which is obtained by producing crops a few weeks earlier than is possible in a less favoured climate, for throughout winter, climatic conditions are very equable and the slight frosts which occur are at infrequent intervals. In the past, the two most approved crops for the purpose were potatoes and broccoli and these were repeated with almost unfailing regularity, almost to the exclusion of other subjects, until bulb-growing came to be thoroughly understood, when it was found to be more profitable than either of the other crops, although it entailed more work. Fortunately the deep loamy soil which produces good crops of potatoes is

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* The first article on the Fuller's Teasel was published in *K.B.*, 1912, p. 345.

quite suitable for bulb culture, therefore it is possible to effect a distinct change of crop and still retain one which is remunerative.

The soil generally is a fertile loam composed largely of humus and disintegrated granite and the best land in the neighbourhood of Penzance is said to be rented at from £8 to £10 an acre. Much of that on the cliffs, however, is worth less than half that amount. Many of the bulbs are grown within a short distance of the sea, and between the village of Paul and Penzance the faces of the cliffs, from a few feet above sea-level to the summit, have been terraced to form small irregular-shaped fields which are fully exposed to the sun. The reclamation of this land from the bare hillsides has been a costly undertaking, for beneath a rough vegetation of gorse, coarse grasses, and other weeds the ground was plentifully besprinkled with pieces of granite varying in weight from a few ounces to several tons. All that could be handled were removed to a depth of 1½ or 2 feet and built up as protection walls and windbreaks around the fields, the larger ones being left where they stood. An idea of the cost involved in this work may be gathered from the fact that the last two acres cleared on one farm, including wall building, was upwards of £60 an acre. It is possible, however, that the work would have been done much cheaper by contract.

Generally, the bulbs growing on the cliff sides are as healthy and vigorous as those planted elsewhere but in a few instances, where the foliage is sometimes washed by spray or there is insufficient shelter from wind, they are not doing well. The two most serious drawbacks to successful cultivation appear to be badly drained ground and exposure to rough winds and it is courting failure to form plantations unless proper provision is made to ensure thorough drainage and efficient shelter. In the most exposed places on the Mainland, shelter is first provided by walls of stones and soil 3 to 4 feet high, and after that by hedges of elderberry. The elderberry does not, however, appear to be an ideal plant for the purpose as it becomes leggy and thin at the bottom. In Tresco, the great hedge plant is *Escallonia macrantha* and the bulb fields are intersected by hedges 6 feet high. But these are within a shelter belt of *Pinus insignis* and *Cupressus macrocarpa* and it is doubtful whether the same plant would prove so satisfactory on the exposed cliffs near Penzance. The plants one would suggest for trial are *Euonymus japonicus*, *Olearia Haastii*, sea buckthorn, (*Hippophae rhamnoides*) common gorse, and various kinds of *Tamarix*. In one place *Fuchsia Riccartoni* was noted doing very well as a hedge in a very exposed place. Between the *Escallonia* hedges at Tresco further protection is provided by screens of the common reed (*Phragmites communis*). The reeds are collected when dry and woven between strands of wire to form long mats. These are then secured in an upright position between stout posts. In other places old fishing nets are used as a wind break but the reed mats are vastly superior and may be easily made by farm hands. Ordinary close sheep hurdles might also be introduced with advantage. There is one use for which old fish netting is well adapted, that is secured on stakes to form a screen for young hedges. Plants screened in this way develop much more rapidly than those left unprotected. Wind plays the greatest havoc

amongst the bulbs after the leaves are fully grown, although it is a disadvantage from the time growth commences. A violent wind causes the leaves to be laid almost flat on the ground, and although some rise again, many are so injured that they die prematurely and the bulbs suffer in consequence. The injurious effect of wind may be easily seen in fields where one part is more exposed than another for in the exposed places the leaves are shorter and narrower and the bulbs smaller than where there is greater protection.

The cultural methods adopted in the Scillies and on the Mainland are practically the same. As a rule ground which is to be planted with Narcissi is heavily manured and cropped with potatoes the previous spring. Favoured manures are farmyard manure, seaweed, and the various fertilisers which are rich in potash and phosphates. The potatoes are lifted between the last week in April and the end of May, and the ground is dug or ploughed, levelled, and prepared for planting as opportunity offers. No manure is given at this period but if lime is required a dressing is provided. Planting is usually done as early as possible, although, if there is proper storage convenience for the bulbs, it may be left as late as the end of September. Late planting is favoured when the ground is very weedy, as unplanted ground is cheaper to clean than that which has been planted. In the larger fields a plough is used in the planting. By its aid a shallow furrow or trench is made. Men or boys follow and place the bulbs in position and they are covered with about 4 inches of soil as the next furrow is made. The furrows are made about 9 inches apart and the bulbs are placed from 4 to 6 inches apart in the rows according to variety. Six furrows are made and planted, then a space of a foot or so is left to facilitate weeding and the gathering of the flowers. This is followed by more beds of six rows each, with paths between, throughout the field. In the smaller fields the same method is adopted but the work is usually done with spades. Some growers allow the paths to remain almost on a level with the surface of the beds but others prefer to arrange that the tops of the paths shall be a little lower than the bases of the bulbs so that in wet seasons the ground drains better and the bulbs ripen more satisfactorily. As no two growers appear to plant at quite the same distance apart it is difficult to say definitely how many bulbs are planted on an acre of ground, but usually between 200,000 and 220,000. After early planting, the ground is hoed once or twice before the shoots are near enough to the surface to be injured by the hoe and subsequently the ground is cleaned periodically until the bulbs are lifted. Lifting takes place at the end of the third year as soon as the foliage is dead. Some growers turn the bulbs out with a plough but others prefer to lift them with forks. They are carried into shallow heaps and dried, graded into three or four sizes, sometimes by hand and sometimes by machinery, and stored in heaps out of doors, or in sheds, until planting time or until they are sold as the case may be. The ground they have occupied is then manured heavily and planted with potatoes the following spring, after which it is again planted with bulbs. A distinct change of ground for a longer period is advised whenever it is possible, but the difficulty of providing proper shelter is against a long rotation of other crops. The

exchange of bulbs between the Scilly Islands and the Mainland is productive of good results as it infuses new vigour into those which show signs of deterioration.

The earlier flowers appear about Christmas and from that time until Easter flowers are gathered regularly. All are collected in the bud stage or as they are about to open, partly that they may be hastened into flower and partly that they shall not be injured by rough weather. They are placed at once in jars of water in a sunny greenhouse or shed, which is usually heated by hot water pipes, to open. When fully expanded they are tied in bunches of 12 blooms each, care being taken to exclude poor flowers and to arrange them so that all face in the same direction. Some growers place a little foliage with the flowers but the practice is not a general one, for it is said to make little or no difference to the price, whilst it increases the labour, and adds to the weight, so increasing cost of carriage. The bunches are then placed in water until a short time before they are despatched. They are then packed in light wooden boxes made to a regulation size for convenience of handling. The dimensions are roughly 23 inches long, 16 inches wide and 4 inches deep. The boxes are lined with soft paper, leaving sufficient to hang over the sides and ends to cover the flowers when packed. From two dozen bunches of the larger-sized flowers to five-and-a-half dozens of the smaller-flowered kinds are packed in each box. The lids are secured with string instead of nails for the convenience of salesmen and buyers, and when a large consignment is being sent to one place three boxes are tied together. In each case the number of bunches and the name of the variety is written on the outside for the information of commission agents and buyers, and after addressing and delivering to the boat or station the grower has finished, the commission agent paying transit charges and deducting them, together with his commission, from the proceeds of the sales. A great many flowers are sent to Covent Garden, but markets for others are found in Birmingham, Liverpool, Leeds, Manchester and other towns.

The boxes are never returned but are sold with the flowers. They are made by the farmers but the wood is purchased cut to the necessary size. Delivered at Penzance the wood costs at the rate of £15 per thousand boxes, an increase it is said, of between £3 and £4 a thousand within the last year.

During the present spring the flower crop has been smaller than usual but in a normal year every good, sound bulb planted during the previous year is calculated to produce one flower; those in their second year usually produce two flowers each and those in their third year three or more flowers each. Any which are left in the ground for a longer period deteriorate and hardly pay for gathering. Thus, an acre of ground may be said to produce a minimum of from 200,000 flowers the first year to 600,000 the third year. Ground which has been planted with small bulbs, however, gives practically no return the first year. Much of the work connected with cultivation is conducted by the ordinary hands in the regular routine of the farm but extra hands are engaged for bunching and packing. Some of these are paid by the day, a certain number of

bunches constituting a day's work, whilst others work piece work. On one of the largest farms the former practice is adopted and after the regulation number for the day has been tied, the workers are allowed to make overtime at the rate of 6*d.* an hour.

As the conditions under which the work is conducted varies to some extent in different places it was not possible to obtain definite figures regarding the actual expenses and income from an acre of ground, but anyone who requires such information can obtain a good guide from the article by Mr. J. Waugh on "Narcissus Cultivation" which appeared in the "Journal of the Board of Agriculture," for March, 1909, pp. 897–909.

With regard to the prices of flowers, the following were given me by a Penzance farmer as the average gross prices of the chief kinds grown, arranged in their order of flowering :—

Variety.	Price per dozen bunches.		Remarks.
	Earliest flowers.	Later flowers.	
Soleil d'Or	1*s.* 6*d.*	1*s.*	
Henry Irving ...	2*s.* 6*d.*	1*s.* 6*d.*	
Golden Spur ...	2*s.* 6*d.*	1*s.* 6*d.*	
Princeps	1*s.* 3*d.*	—	Keeps a steady price.
Sir Watkin	1*s.* 6*d.*	1*s.*	
Victoria	2*s.* 6*d.*	2*s.*	
Emperor	2*s.*	—	Keeps a steady price.
Empress	1*s.* 9*d.*	1*s* 6*d.*	
Poeticus ornatus ...	1*s.* 6*d.*	—	
Barrii conspicuus ...	2*s.*	—	
Scilly White ...	1*s.* 3*d.*	—	Flowers throughout the greater part of the season and keeps a steady price.

The following figures, taken from advice notes of sales conducted during Easter week, give an idea of the railway charges and salesman's commission :—Eight boxes containing 32½ dozen bunches realised £2 10*s.* 7*d.*, less 7*s.* 11*d.* expenses, and twelve boxes containing 39 dozen bunches made £3 11*s.* 11*d.*, less 11*s.* 9*d.* expenses. These were sent from Penzance to London. Of blooms sent to Manchester, ten boxes containing 33 dozen bunches were sold for £3 3*s.* but there were expenses amounting to 10*s.* 5*d.*, whilst six other boxes realised £1 4*s.* 3*d.*, with expenses of 6*s.* 2*d.* The variety in each case was Emperor. The Barrii and Poeticus varieties cost less in carriage and more bunches can be packed in a box. Twelve boxes of Poeticus ornatus sent to Manchester with the Emperors realised £4 2*s.* and the expenses were 9*s.* 11*d.*

The smaller growers appear to suffer from low prices more than those who market large quantities of flowers, probably by reason of a more limited choice of markets, whilst there are numerous complaints from both large and small growers about high railway rates and French competition. Everyone, however, whether he is a large or small grower, seems to work on his own account, and it is possible that the adoption of some scheme of co-operation would be

attended with good results. A co-operative society with a distributing centre in Penzance, in communication with the chief markets of the country, might very easily place many of the flowers to better advantage than at present, and the same with surplus bulbs; whilst manures, wood for boxes and other things might be obtained more economically.

Such a society might also be the means of extending the flower industry by encouraging the culture of other kinds of flowers. Already a few other kinds are grown, such as violets, anemones, and tulips but a larger business might be developed. *Anemone fulgens* about Penzance is less satisfactory than Narcissi for it does not give good results in succeeding years. A scheme has therefore been adopted by which roots are purchased from Dutch growers, flowered, and returned to Holland as soon as the foliage is dead.

Richardia africana, the so-called "calla" or "arum lily" thrives remarkably well on the cliffs about Penzance. Several large masses were noted with leaf stalks 3 feet long bearing blades 15 inches by 9. The flower stalks were up to 4 feet in height. The inflorescences have not been marketed but there appears to be a future for them provided the plants could be covered with lights whilst the spathes are developing. From the manner in which this plant is thriving, there can be little doubt but that it will prove valuable for the cut flower trade; but a few experiments are required in order to discover the best means of finishing and marketing the spathes.

Amongst other people I am much indebted to Mr. J. Mitchell of Lower Kemyell near Penzance, for the information he so kindly imparted, and to Mr. Dorrien Smith of Tresco Abbey who gave me every facility for studying the system of culture conducted in his bulb grounds at Tresco.

Perhaps to the latter gentleman more than to anyone else the credit is due of having originated the early flower industry in the Scilly Islands and indirectly about Penzance. It came into being at a time when a wave of agricultural depression was passing over those out of the way parts of the country and it has been instrumental in raising many farmers from financial embarrassment to a comfortable position. Throughout the 30 years during which this gentleman has been growing bulbs on the Island of Tresco, he has, with the assistance of an energetic and sympathetic bailiff, spared neither time nor money in perfecting both cultural and marketing arrangements, the results of the experience thus gained being freely shared with his fellow islanders.

On this estate alone, some 70 acres of bulbs are cultivated and, in addition to the flowers which are grown out of doors, many hundreds of thousands are forced annually, a number of long, low, market houses having been erected for this purpose and for tomato-growing in summer. The flower shed is a model of its kind and is representative of the methodical and business-like arrangements which everywhere exist. The front only is of glass which can be shaded with light blinds when necessary. Immediately before the glass is a stage about $3\frac{1}{2}$ or 4 feet high, the upper six inches having been converted into a water-trough, the bottom of which is covered with small stones. Over the trough are trellises divided into

two-inch squares. The middle of the shed contains a long wide table for bunching and packing. As the flowers are tied in bunches two bunches are placed in each square of the trellis, the stalks in this way standing in water. An hour or so before packing, the water is drained off and the stalks drain quite dry through standing on the stones. Early in the morning all hands begin to pack, the boxes having been prepared overnight, and in a very short space of time 200 or 300 boxes are ready for despatching. On Easter Monday morning 10,000 bunches were packed and despatched in a little over an hour, about 30 men and boys being employed on the work. In addition a large number of parcel post boxes were sent away. As the Penzance boat starts from Scilly between 9 and 10 o'clock in the morning, and only on alternate days, the early morning hours are amongst the busiest of the day for the weight of flowers despatched from the several islands is reckoned in tons. The crop this year was far below the average, 225 tons against 987 tons last year. The heaviest consignment despatched from the islands was 17 tons on March 18th, against a record of 53 tons on March 21st, 1907.

A great many kinds of Narcissi are grown at Tresco but the following sorts are chiefly relied upon for market:—Soleil d'Or, Scilly White, Grand Monarque, Gloriosus, Poeticus ornatus, P. "Horace," Cynosure, Leedsii, Frank Miles, Emperor, Empress, M. J. Berkeley and Golden Spur. Various new kinds are under trial for market work whilst numerous other sorts are grown for their bulbs which find a ready sale at lifting time.

XXVIII.—DIAGNOSES AFRICANAE. LIV.

1441. **Boscia Dawei**, *Sprague et M. L. Green* [Capparidaceae—Capparideae]; affinis *B. caloneurae*, Gilg, a qua foliis longius petiolatis in basin haud cuneato-angustatis, racemis vix pedunculatis, pedicellis longioribus differt.

Arbor parva vel frutex (*Dawe*). *Rami* annotini glabrescentes, griseo-brunnei, 17–25 cm. longi, circa basin 3 mm. diametro, seniores nodosi. *Folia* ramorum annotinorum ramulis abbreviatis pulviniformibus axillaribus insidentia, oblanceolato-oblonga vel obovato-oblonga, ex apice obtuso vel rotundato saepius mucronata, in basin leviter angustata, 2·5–4 cm. longa, 1–1·2 cm. lata, coriacea, supra glabra, nervo intermedio leviter impresso, subtus minute pilosa, nervo intermedio prominente, nervis lateralibus utrinque inconspicuis; petioli 4–5 mm. longi, dense breviter pilosi; stipulae subulatae, ad 2 mm. longae. *Racemi* simplices, solitarii, axillares, nonnunquam inferne folia 1–3 gerentes, floribus dense confertis ideoque corymbosis, 1·5–2 cm. longi et diametro; rhachis et pedicelli breviter patenter pilosi; bracteae spatulato-filiformes, circiter 2·5 mm. longae; pedicelli 5–9 mm. longi, patentes. *Sepala* patentia, ovata, 3 mm. longa, 2 mm. lata, utrinque, praesertim extra, puberula, dense papillato-ciliata. *Discus* fimbriatus, 1 mm. altus. *Stamina* 6–7; filamenta 3·75 mm. longa; antherae 0·75 mm. longae.

Gynophorium 2 mm. longum, glabrum. *Ovarium* ovoideum, 1·5 mm. longum, 1 mm. diametro, 1-loculare, placentis duabis ; ovula 10.

Tropical Africa. Uganda : Ankole, *Dawe* 383.

1442. **Boscia patens**, *Sprague et M. L. Green* [Capparidaceae—Capparideae] ; affinis *B. angustifoliae*, A. Rich. et *B. corymbosae*, Gilg ; ab illa floribus minoribus, inflorescentia paniculata ramis patentibus, ab hac ramis paniculae anguste pyramidalibus differt.

Rami glabri, hornotini graciles, fulvi, nodosi, inconspicue lenticellati, seniores virgati, griseo-brunnei, dense lenticellati, 30 cm. infra apicem circiter 4 mm. diametro. *Folia* ramulorum hornotinorum alterna, ramorum seniorum ramulis abbreviatis pulviniformibus axillaribus insidentia, oblanceolato-oblonga vel obovato-oblonga, superne rotundata vel obtusa, rarius retusa, spinuloso-apiculata, in basin angustata, 2–4 cm. longa, 0·8–1·3 cm. lata, minute calloso-denticulata, coriacea, glabra, supra leviter convexa, nervo intermedio supra impresso subtus prominente, utrinque venulis validis dense reticulata ; petioli 2–4 mm. longi, supra densiuscule pilosi ; stipulae triangulari-subulatae, vix 1 mm. longae. *Racemi* compositi, pyramidales, 4–6 cm. longi, ramulos hornotinos foliatos terminantes vel e pulvinis orti ; rhachis glabriuscula vel superne minute puberula, ramis patenter puberulis ; bracteae anguste lanceolato-lineares, 2–2·5 mm. longae, stipulis minutis ; pedicelli 4 mm. longi, puberuli. *Sepala* ovata, patula, 3 mm. longa, 1·75 mm. lata, dense papillato-ciliata. *Discus* fimbriatus. *Stamina* 6–8, intra discum basi gynophorii inserta ; filamenta 1·75 mm. longa. *Gynophorium* 1·25 mm. longum. *Ovarium* ovoideum, 1-loculare, placentis duabus ; ovula circiter 10. *Bacca* subglobosa, circiter 4 mm. diametro, dense elevato-punctata, glabra. *Semina* ad 8.

Tropical Africa. British East Africa : Muka, *Kässner* 906.

1443. **Boscia Powellii**, *Sprague et M. L. Green* [Capparidaceae—Capparideae] ; affinis *B. salicifoliae*, Oliver, a qua floribus majoribus, foliis latioribus in basin valde angustatis, nervis magis distinctis differt.

Arbor parva. *Rami* hornotini pubescentes, 7–33 cm. longi, circa basin 2·5–3 mm. diametro, seniores glabrescentes, pallide fulvi, dense inconspicue lenticellati. *Folia* alterna, oblanceolata vel elliptico-oblanceolata, ex apice obtuso apiculata, in basin sensim angustata, 7–11 cm. longa, 2·5–3 cm. lata, tuberculis minutissimis asperula, utrinque minute puberula, supra nervis prominulis, subtus nervo intermedio prominente, nervis lateralibus prominulis ; petioli 1–1·5 cm. longi, dense breviter pilosi ; stipulae subulatae, circiter 1 mm. longae. *Racemi* simplices, laxiusculi, axillares, superiores plus minusve conferti, circiter 31 cm. longi ; rhachis minute puberula ; bracteae caducae ; pedicelli 4–8 mm. longi, puberuli. *Sepala* ovata, deflexa, 5 mm. longa, 3 mm. lata, utrinque minute puberula, dense papillato-ciliata. *Discus* crassus, fimbriatus, 1 mm. altus, laciniis brevissimis multiseriatis. *Stamina* circiter 18 ; filamenta 8·5 mm. longa ; antherae 1 mm. longae. *Gynophorium* 7 mm. longum, leviter pubescens. *Ovarium* ovoideum, 1-loculare, placentis duabus ; ovula circiter 10. *Bacca* globosa, circiter 7 mm. diametro, glabra.

Tropical Africa. British East Africa : Makindu and Kibwezi, *Powell* 17.

1444. **Protorhus namaquensis**, *Sprague* [Anacardiaceae-Rhoideae]; species foliis linearibus distincta.

Rami exstantes usque ad 4 mm. diametro, irregulariter sulcato-rugosi, pallide brunnei ; ramuli patuli vel ascendentes, 9–15 cm. longi, dense foliati, rubro-castanei, glabri, sicco longitudinaliter rugosi, circa basin 2·5–3 mm. diametro. *Folia* linearia, utrinque angustata, acute apiculata, 4–7 cm. longa, 3–4 mm. lata, coriacea, glabra, cartilagineo-marginata, supra obscure viridia, nervo intermedio prominulo brunneo, nervis lateralibus saepius occultis, subtus pallide viridia, glaucescentia, nervo intermedio prominente brunneo vel castaneo, nervis lateralibus valde sinuatis leviter impressis nigrescentibus ; petioli applanati, 2–3 mm. longi. *Thyrsi* ramulos terminantes, inferne foliati, rhachi valde anfractuosa ; pedicelli curvati, circiter 2 mm. longi. *Flores* ♀ tantum visi. *Sepala* late ovata vel subdeltoidea, obtusa vel rotundata, inaequalia, 0·8–1·3 mm. longa, 0·8–1 mm. lata, extra minute pilosa. *Petala* oblonga vel elliptico-oblonga, 3 mm. longa, 1·6–1·7 mm. lata, apice rotundata, intus minute papillosa. *Staminodia* 1·3 mm. longa. *Discus* annularis, 0·3–0·4 mm. altus. *Ovarium* subglobosum, circiter 1·7 mm. altum, 1–loculare ; stylus crassus, 0·7 mm. longus, stigmatibus reflexis.

South Africa. Little Namaqualand, *Wyley* (Herb. Trin. Coll. Dublin).

1445. **Vangueria Dalzielii**, *Hutchinson* [Rubiaceae-Vanguerieae]; *V. velutinae*, Hiern, habitu similis sed ramulis foliisque glabris valde distincta.

Frutex erectus ; rami teretes, cortice cinereo deciduo obtecti ; ramuli juniores foliati, virides, glabri, internodiis 1–2 cm. longis. *Folia* opposita vel 3–4–natim verticillata, sessilia vel breviter peliolata, obovata vel elliptico-obovata, apice obtusa vel breviter obtuse acuminata, basi paulo angustata, 3–5 cm. longa, 1·5–3 cm. lata, margine integra et anguste cartilaginea, utrinque glabra, infra glauco-viridia, nervis lateralibus utrinque 5 obliquis distinctis infra paulo prominentibus, venis subinconspicuis ; stipulae interpetiolares, e basi lata subulato-lanceolatae, obtusae, vix 3 mm. longae, intra basi longe pilosae. *Flores* ad nodos ramulorum defoliatorum fasciculati ; pedicelli usque ad 5 mm. longi, glabri. *Receptaculum* ambitu campanulatum, 1·5 mm. longum, glabrum. *Calycis* lobi 5, lineari-lanceolati, subobtusi, 2 mm. longi, 0·5 mm. lati, carnosi, extra glabri, intra minute puberuli. *Corollae* tubus rectus, subcylindricus, 3 mm. longus, medio 1·5 mm. diametro, extra glaber vel parce puberulus, intra infra medium annulo pilorum reflexorum instructus, supra medium pubescens ; lobi 6, lanceolati, breviter apiculati, 3 mm. longi, 1·5 mm. lati, subcarnosi, glabri. *Antherae* inclusae, 0·75 mm. longae ; filamenta corollae tubo adnata. *Ovarium* 5-loculare ; stylus breviter exsertus, 5 mm. longus, glaber, utrinque paulo angustatus ; stigma cylindrico-capitatum, 1·25 mm. longum, 0·75 mm. diametro, minute bifidum. *Fructus* 1–2 loculares, subglobosi vel oblique ellipsoidei, circiter 1 cm. longi, calycis lobis coronati.

Tropical Africa. Northern Nigeria : Katagum District, *Dalziel* 379.

Dr. Dalziel states that the plant is used as a remedy for arrow poison.

The vernacular name is "Bi ta ka tsira."

1446. **Senecio baberka**, *Hutchinson* [Compositae-Senecionideae]; affinis *S. Marlothiano*, O. Hoffm., sed foliis plerumque minoribus semper integris, involucri bracteis angustioribus differt.

Herba usque ad 30 cm. alta; caules simplices vel parce ramosi, erecti, subteretes, glabri, internodiis 1·5–2·5 cm. longis. *Folia* sessilia, lanceolata vel oblanceolata, apice obtusa, basi angustata, 1·5–4·5 cm. longa, 3–8 mm. lata, integra, tenuiter chartacea, glabra, pallide viridia, e basi 3–5-nervia, nervis cum margine subparallelis utrinque prominentibus. *Capitula* flava, solitaria, longe pedunculata, radiata, ambitu oblonga, 1·5 cm. longa et diametro; pedunculi 4–15 cm. longi, ebracteati, circiter 1·5 mm. crassi, glabri. *Involucri bracteae* uniseriatae, liberae, lineares vel lineari-oblongae, obtuse acuminatae, 1 cm. longae, coriaceae, margine membranaceae, praeter apicem puberulum, utrinque glabrae. *Receptaculum* leviter concavum, laeve, circiter 5 mm. diametro. *Flores radii* fertiles, pauci; corollae tubus cylindricus, 6 cm. longus, glaber; lamina oblonga, apice trifida, 7 mm. longa, 3mm. lata, 6–nervia, glabra; pappus corollae tubo aequilongus; stylus vix exsertus. *Flores disci* numerosi; corollae tubus anguste obconicus, 7 mm. longus, glaber; lobi 5, ovato-triangulares, obtusi, 1 mm. longi, extra rufo-pubescentes; antherae 2·5 mm. longae; stylus leviter exsertus, bilobus, lobis truncatis apice pubescentibus; pappus 6 mm. longus, barbellatus; achaenia lineari-oblonga, 7 mm. longa, costata, costis breviter albo-pubescentibus.

Tropical Africa. Northern Nigeria: Katagum District, *Dalziel* 390.

According to Dr. Dalziel the vernacular name is "Baberka," and the plant produces a bitter medicine.

1447. **Asystasia Drake-Brockmanii**, *Turrill*, [Acanthaceae-Acanthoideae]; ab affini *A. macrophylla*, Lindau, foliis minoribus facile distinguenda.

Herba erecta: caules teretes vel obscure quadrangulares, supra sulcati, primo pubescentes, mox glabri. *Folia* late ovata, apice obtuse acuminata, basi subrotundata vel cuneata, usque ad 4·5 cm. longa et 3·5 cm. lata, chartacea, pagina utraque minute pubescentia, margine integra, nervis lateralibus utrinque circiter 5; petioli 2–3 mm. longi, pubescentes. *Inflorescentia* terminalis vel axillaris, pluriflora; pedicelli usque ad 1·3 cm. longi, pubescentes; bracteae inferiores foliis similes sed minores et sessiles, superiores lanceolatae vel lineares, acutae, sessiles, circiter 3·5 mm. longae et 0·75 mm. latae, pubescentes; bracteolae 2, lineares, apice acutae, sessiles, 4–5 mm. longae, 0·5 mm. latae, pubescentes. *Sepala* 5, omnino libera, inter se aequalia, linearia, apice acuta, 3 mm. longa, 0·75 mm. lata, leviter pubescentia. *Corollae* tubus circiter 3·5 cm. longus, infra cylindricus, 2–3 mm. diametro, superne ampliatus, circiter 1·5 cm. diametro, extra glaber, intra parte inferiore pubescens; limbus circiter 4 cm. diametro, 5–lobatus, lobis rotundatis inter se subaequalibus, circiter 1·3 cm. diametro. *Stamina* 4, filamentis 2 longioribus 1·3 cm. longis, 2 brevioribus 8–9 mm. longis, omnibus glabris; antherarum loculi 2, uno altero paulo altiore affixo, glabri, apice obtusi, basi omnes calcare bidentato instructi; pollinis granula oblongo-ellipsoidea, 75 μ longa, 45 μ diametro. *Discus* cupuliformis, 1 mm. altus, ovarium cingens.

Ovarium conicum, 3·5 mm. altum, 1·5 mm. diametro, glabrum vel apice leviter pubescens, ovulis in loculo quoque 2 ; stylus 2·5 mm. longus, inferne pubescens, superne glaber, stigmate capitato indistincte bilobato.

TROPICAL AFRICA. Abyssinia: Geru Abbas, *Drake-Brockman* 230.

1448. **Echolium longiflorum**, *Turrill* [Acanthaceae-Justiciae]; *E. striati, var minore*, Balfour, affinis sed foliis junioribus dense pubescentibus, bracteis brevioribus, corollae tubo multo longiore facile distinguenda.

Frutex 1 m. altus (ex *Methuen*), ramis teretibus adpresse albo-puberulis. *Folia* juniora suborbicularia, apice rotundata, basi cordata, 4·5 mm. longa, 4·5 mm. lata, utrinque dense pubescentia. *Spicae* anguste cylindricae, compactae, multiflorae, internodiis inconspicuis ; bracteae oblongo-lanceolatae, apice acutae, 2·75 mm. longae, 1·5 mm. latae, dense puberulae ; bracteolae lineari-lanceolatae, 2 mm. longae, 0·75 mm. latae, dense puberulae. *Sepala* 5, linearia, apice acuta, 4 mm. longa, 0·75 mm. lata, glanduloso-puberula. *Corollae* tubus anguste cylindricus, 3·5 cm. longus, medio 0·75 mm. diametro, ima basi 1·5 mm. diametro, extra pubescens, intus glaber ; limbus distincte bilabiatus, extra pubescens, intus glaber ; labium anticum trilobatum, lobis lateralibus ellipticis apice obtusis 1·2 cm. longis 5·5 mm. latis, lobo intermedio obovato apice rotundato 1·2 cm. longo 1 cm. lato ; labium posticum lineare, apice leviter bifidum, 1 cm. longum, 1 mm. latum. *Stamina* 2, filamentis 2·5 mm. longis glabris, antheris typicis 2·5 mm. longis ; pollinis granula globosa, 55 μ diametro. *Ovarium* subcylindricum, 3 mm. longum, 0·75 mm. diametro, dense puberulum, typice 4-ovulatum ; stylus 3·4 mm. longus, inferne pubescens ; stigma indistincte bilobatum. *Capsula* ovoidea, stipitata, compressa, 1·5 cm. longa, 7 mm. diametro, puberula, 3-seminata (an semper ?). *Semina* ovata, valde compressa, apice obliqua, 6 mm. longa, 4 mm. lata, laevia.

MADAGASCAR. Tongobory, *Hon. P. A. Methuen*.

1449. **Loranthus entebbensis**, *Sprague* [Loranthaceae]; affinis *L. Schweinfurthii*, Engl., a quo indumento, foliis minoribus, floribus majoribus, toro multo majore bracteam multo superante differt.

Innovationes pilis verticillato-ramosis ferrugineo-tomentosae. *Ramuli* pallidi, glabrescentes, exsiccando longitudinaliter rugosi, nodosi, 30 cm. infra apicem circiter 4 mm. diametro ; internodia 4–12 mm. longa. *Folia* opposita vel tandem alterna, ovata usque lanceolata, apice obtusa, basi plus minusve cuneata, 4–6·5 cm. longa, 1·8–3·8 cm. lata, coriacea, nervis subtus sparse ferrugineo-pilosis exceptis glabra ; nervi laterales utrinque circiter 5, satis obliqui, utrinque prominuli ; costa supra prominula, subtus prominens ; petioli 9–13 mm. longi, ferrugineo-pubescentes. *Umbellae* axillares, solitariae, 9–10-florae ; pedunculus in toto circiter 5 mm. longus, ferrugineo-puberulus ; pedicelli 3–4 mm. longi, crispule pubescentes ; bractea e basi patelliformi valde unilateralis, ovata, vix 2 mm. longa, dorso umbonato-incrassata, margine ventrali 0·5 mm. alto. *Torus* calycecum suburceolatus, 3·5–4 mm. longus, 2·7 mm. diametro, ferrugineo-pubescens. *Calyx* in toto 0·7–0·8 mm. longus, ciliatus, dentibus deltoideis 0·3–0·4 mm. longis pilis inclusis ; discus

intramarginalis adnatus, 0·3 mm. altus. *Corolla* circiter 5 cm. longa, extra ferrugineo-puberula, parte apicali alabastro oblonga obtusa 5·5 mm. longa pentagona inter angulos excavata; tubus circiter 1·4 cm. unilateraliter fissus, ampulla basali oblongo-ovoidea 7–8 mm. longa; lobi erecti, spatulato-lineares, 1·1 cm. longi, parte superiore subnaviculiformi acuta 5·5 mm. longa 1·4 mm. lata 0·8 mm. crassa, strato duro basi abrupte terminata. *Filamenta* basi corollae loborum inserta, deflexa vel involuta, 7 mm. longa, sursum sensim angustata, superne 1 mm. incrassata, pallidiora, dente 0·3 mm. longo; antherae lineares, 3 mm. longae. *Discus* crassus, 0·6–0·7 mm. altus, breviter dentatus. *Stylus* superne metuliformis, parte incrassata circiter 8 mm. longa inter costas valde canaliculata, collo 3 mm. longo; stigma ellipsoideum, 0·8 mm. longum.

Tropical Africa. Uganda: Entebbe, *Rutter*.

Specimens of *L. entebbensis* were received for identification from Mr. W. R. Rutter, Chief Forestry Officer, Uganda, according to whom the species is attacking most of the trees in the township of Entebbe.

L. entebbensis is closely allied to *L. Schweinfurthii*. The nature of the indumentum affords an important distinction. In *L. entebbensis* it is composed of longish rusty much-branched hairs which soon fall off, whereas in *L. Schweinfurthii* the hairs are short, pale, little-branched and relatively persistent.

1450. **Cyrtanthus epiphyticus**, *J. M. Wood* [Amaryllidaceae-Amarylleae]; affinis *C. Macowani*, Baker, sed foliis duplo latioribus, perianthii lobis suborbicularibus vel late ellipticis et habitu epiphytico differt.

Bulbus 9–11 cm. longus, 3–3·5 cm. crassus, basi ovoideus, superne in collum elongatum attenuatus, brunneus. *Folia* 2, cum floribus coaetania, 30–50 cm. longa, 2·5–3·5 (sicco 1·2–1·8) cm. lata, late linearia, apice et basi attenuata, obtusa, plana, nec torta, viridia, subtus vix glauca, costa subtus valde prominente. *Scapus* subteres, foliis brevior, basi curvatus, viridis. *Spathae* valvae duae, 3–3·5 cm. longae, 6–8 mm. latae, lanceolato-attenuatae, membranaceae. *Umbellae* 7–15-florae. *Pedicelli* 1·5–2·8 cm. longi, virides. *Perianthium* coccineum; tubus 3–3·5 cm. longus, curvatus, fauce 8 mm. diametro, basi gradatim attenuatus; limbus 1·4–1·6 cm. diametro; segmenta 6–7 mm longa et lata, suborbicularia vel late elliptica, apice late rotundata, exteriora apiculata. *Stamina* inclusa, biseriata; filamenta brevissima; antherae oblongae, dorsifixae. *Ovarium* trigonum, luteo-viride; stylus staminibus longior, filiformis; stigma 3-lobum. *Capsula* 1·5–2 cm. longa, oblonga, glabra. *Semina* 6–7 mm. longa, 2·5 mm. lata, alata, samaroidea, obtusa, nigra.

South Africa. Natal: in a forest at Ensikeni, at 1200 m. alt., near the border between Natal and Griqualand East, growing epiphytically, with their bulbs embedded in the moss on the trunks and branches of a species of *Podocarpus* (Yellowwood), sometimes at an elevation of 20 m. or more above the ground, *Wood* 12,041.

This appears to be the first Amaryllidaceous plant recorded as being epiphytic. In a letter sent to Kew, Mr. Wood states that the plant was discovered by his adopted son, Mr. Walter Haygarth,

who found it "growing on stems and branches of Yellowwood trees, always in tufts of moss, which its roots penetrate, but do not, I think, even touch the bark of the tree. The only plants on the ground were a few, not many, that had been dislodged from the trees by the wind or by falling branches, and these were all still growing in the moss which had fallen with them. He also found a few growing in crevices of rocks, but again imbedded in moss." In form, the seeds are remarkably like the fruit of a Maple or Sycamore on a very reduced scale, and are admirably adapted for dispersal by wind.

XXIX.—THE STERILISATION OF SEED.

(With Plates.)

Ivy Massee.

The sterilisation of seed is, in many instances, a necessary preliminary to work on plant physiology. Two different methods have been followed: in the one case sterilisation is effected by mechanical means, and the seeds are first washed in a sterilised liquid and then thoroughly shaken up in sand. This method was followed by Mazé in his researches on the development of maize; but is only practicable when the testa of the seed is smooth. The second, and more usual method is to treat the seed with an antiseptic substance, mercuric chloride being most frequently used. This has proved unsatisfactory for the following reasons: the spores of certain bacteria are resistant to such treatment; the presence of the antiseptic often contaminates the culture medium, and thirdly the seed tends to be injured if the treatment is prolonged.

Formaldehyde has also been used, but in some cases, as shown by Kehler,* the seeds treated proved more susceptible to injury than the spores of the fungi or bacteria it was sought to destroy.

Owing to the unsatisfactory results of the methods of sterilisation usually employed, de Zeeuw† experimented with various other substances and decided in favour of hydrogen peroxide (H_2O_2). Pinoy and Magrou‡ have also experimented with hydrogen peroxide and give a favourable report of the results.

According to the last-named authors, it was found that after the seed had been immersed in hydrogen peroxide for 5 hours, all spores were killed, yet the germination of the seed was not much retarded, and in certain instances it was even hastened. Treated seeds of *Orobus tuberosus* germinated in eight days, whereas untreated seeds of the same plant required a month to germinate.

All the above experiments were conducted with the object of obtaining, for physiological research, seeds absolutely free from living germs, more especially bacteria. It was suggested to me by my father that the action of hydrogen peroxide on fungus spores and on the germination of seed might prove to be of great value in preventing the spread of plant diseases due to the presence of fungus spores on seed. For the purpose of testing this idea, a series of experiments have been made in the Jodrell laboratory.

In the first place, in order to test the action of hydrogen peroxide on the vitality of seeds, two batches of seed of each kind experimented on were soaked in hydrogen peroxide for 4 hours and 24 hours respectively, and a control batch, of each kind of seed, was soaked in water for a corresponding length of time. All the soaking was done in closed glass dishes.

In every instance seed treated with hydrogen peroxide was retarded in germination, as compared with seed soaked in water for a corresponding length of time. The germination of the seed soaked in hydrogen peroxide for 24 hours was much more retarded than of that soaked for 4 hours.

On the other hand, seedlings from treated seed grew at a quicker rate than those from untreated seed, and as a rule, within a fortnight were equal in size or even larger than the plants raised from the untreated seed. Certain kinds of seed were killed after being treated for 24 hours. In every instance, except where the treated seed was killed outright, the percentage of germination was equal in treated and untreated seed, and, as a rule, every seed germinated. Fuller details are given in the accompanying table.

In testing the vitality of treated fungus spores, very much the same course was followed as that described for seeds. Pinoy and Magrou found that immersion for five hours destroyed all germs present on seeds; but they were mostly concerned with bacteria which are much more resistant to the action of hydrogen peroxide, and to other germicides also, than are the spores of fungi.

Judging from my experiments on fungus spores and on seed, immersion in hydrogen peroxide for three hours is sufficient to kill all fungus spores present on the surface, without, so far as is known, causing injury to the seed.

Batches of a few different kinds of fungus spores treated for half an hour only, showed accelerated germination as compared with spores soaked in water for the same length of time.

The seed should be treated in closed vessels, bottles, &c., which should be shaken at intervals, otherwise a layer of air bubbles tends to surround the seed and so prevent the action of the fungicide. This method of sterilising seed should prove of value, in addition to home use, in those instances when sterilisation of seed is insisted upon in other countries and should supersede sterilisation of seed by fumigation, which, although it may be effective against insect pests, is comparatively useless so far as the spores of fungi are concerned. In the event of using this method for sterilising seed, it would be best in the first case to experiment on a small quantity of seed in order to test the effect of the hydrogen peroxide on the vitality of the seed before treating a large consignment.

It is doubtful whether hydrogen peroxide would prove of value in killing hibernating mycelium which might be present in bulbs, tubers, &c. Only one experiment in this direction has been made, with the mycelium of the *Botrytis* causing the well-known "Lily disease," present in the stem of a lily. Two pieces of lily stem were treated for 24 hours, and afterwards the fungus grew freely and produced fruit, while on the control piece of the same stem, soaked in water for an equal length of time, the mycelium grew very slowly as compared with the treated pieces.

CUCURBITA PEPO. PLANTS AFTER BEING SOWN 5 DAYS.

I. Untreated. II. Treated 4 hours. III. Treated 24 hours.

[*To face page* 184.

CUCUMIS MELO. PLANTS AFTER BEING SOWN 8 DAYS.

I. Treated 4 hours. II. Not treated. III. Treated 24 hours.

The hydrogen peroxide used is known as "commercial, 10 vols." and was not diluted. The price is 5*s*. per gallon. The same liquid may be used for treating several consecutive batches of seed, until its fungicidal action becomes exhausted. It is fit for use so long as it is capable of bleaching a rose-coloured solution of permanganate of potash, to which a few drops of sulphuric acid have been added. (Condy's fluid may be used as a substitute for permanganate of potash.)

Hydrogen peroxide keeps better when the vessel containing it is completely filled; it should also be kept in a cool place, and in the dark. Taking everything into consideration, sterilisation of seed by means of hydrogen peroxide is cheaper and much more effective than by any method of fumigation known. The preparation of hydrogen peroxide is a simple process, and in tropical countries where its deterioration would be hastened, it would be advisable to have it prepared on the spot.

In the following tables the particulars of the experiments on various seeds and fungus spores are given in detail :—

TREATMENT OF SEED.

Name of seed, and number sown.	Time of treatment.	First appearance above ground.	Remarks.
Cucurbita pepo (6) ...	untreated ...	4 days	After 8 days plants from treated and untreated seeds were, on an average, of equal size; while after 14 days the batches treated for 24 hrs. showed most growth.
	treated 4 hrs.	5 days	
	treated 24 hrs.	6 days	
Trichosanthes anguina (6).	untreated ...	6 days	
	treated 4 hrs.	7 days	
	treated 24 hrs.	8 days	
Cucumis melo (14) ...	untreated ...	4 days	
	treated 4 hrs.	5 days	
	treated 24 hrs.	6 days	
Lagenaria vulgaris (6)	untreated ...	4 days	
	treated 4 hrs.	5 days	
	treated 24 hrs.	6 days	
Acacia Richii (3) ...	untreated ...	7 days	
	treated 24 hrs.	killed	
Clitoria glycinoides (3)	untreated ...	8 days	Treated seed produced feeble seedlings.
	treated 24 hrs.	16 days	
Caesalpinia pulcherrima (3).	untreated ...	14 days	
	treated 24 hrs.	killed	
Bauhinia tomentosa (3)	untreated ...	14 days	
	treated 24 hrs.	killed	
Sweet Peas—			
Evelyn Hemus (10)	untreated ...	7 days	Plants from treated and untreated seeds equal in size 5 days after the treated plants appeared above ground.
	treated 24 hrs.	11 days	
Dainty Spencer (10)	untreated ...	7 days	
	treated 24 hrs.	14 days	
Lord Nelson (10) ...	untreated ...	7 days	
	treated 24 hrs.	killed	
Ricinus communis (2)	untreated ...	6 days	Plants from treated and untreated seeds equal in size from the first.
	treated 4 hrs.	6 days	

TREATMENT OF FUNGUS SPORES.

Name of spores.	Treatment.	Germination.	Remarks.
Ustilago avenae, Jensen	not treated ...	24 hrs. ...	Germination abundant.
	treated ½ hr. ...	all killed	Spores bleached. Protoplasm contracted.
Ustilago Vaillantii, Tul.	not treated ...	24 hrs. ...	Hemibasidium formed but not free.
	treated ½ hr. ...	24 hrs. ...	More forward than untreated lot.
	treated 2 hrs.	three days	Germination feeble. Many killed.
	treated 4 hrs.	all killed	
Uromyces ficariae, DC.	not treated ...	24 hrs. ...	Germination abundant.
	treated 1 hr. ...	all killed	
Aecidium ranunculaceaarum, DC.	not treated ...	24 hrs. ...	Germination very vigorous.
	treated 1 hr. ...	all killed	
Sclerotinia sclerotiorum, Mass.	not treated ...	24 hrs. ...	Did not germinate in water, but freely in decoction of prune juice.
	treated ½ hr. ...	all killed	
Leptosphaeria acuminata, Sacc.	not treated ...	two days	Vigorous germ-tube from every cell of the spore.
	treated 1 hr. ...	all killed	
Erysiphe graminis, DC.	not treated ...	24 hrs. ...	Germination abundant.
	treated 1 hr. ...	all killed	
Macrosporium solani, Cke.	not treated ...	24 hrs. ...	Mycelium rampant in 24 hrs.
	treated 1 hr. ...	all killed	
Heterosporium echinulatum, Berk.	not treated ...	24 hrs. ...	The spores were 3 months old. Germination vigorous.
	treated 1 hr. ...	all killed	
Cladosporium epiphyllum, Pers.	not treated ...	24 hrs ...	Germination abundant, all put up in decoction of prune juice.
	treated ½ hr. ...	24 hrs. ...	
	treated 2 hrs.	all killed	
Verticillium luteritium, Berk.	not treated ...	two days	Germination vigorous. After 5 days, broken sporophores in the treated batch sprouted vigorously and produced chains of oidia.
	treated 1 hr. ...	all killed	

SUMMARY.

The spores of fungi, also some kinds of bacteria, are as a rule killed by an hour's immersion in hydrogen peroxide; no spores experimented with germinated after similar treatment for two hours.

In nearly every instance the germination of seeds immersed in hydrogen peroxide was retarded. Seeds immersed for four hours were on an average 1–2 days later in appearing above ground than untreated seeds of the same kind. Seeds treated for twenty-four hours were retarded from two to eight days, or in most instances were killed outright. The period of retardation is much less in

seeds which germinate quickly than in the case of seeds whose germination is normally slow. After treated seeds have germinated growth is rapid, and in a short time the plants are equal in size and vigour to the plants from untreated seeds sown at the same time. In some cases the plants from treated seeds are distinctly larger than those from untreated seeds at the end of three weeks. For all practical purposes, soaking seed in hydrogen peroxide for three hours will kill all superficial fungus spores and the seed will not be injured. This method is to be recommended as a substitute for fumigation, which, as a rule, does not kill fungus spores, unless continued for such a time as to damage the seed.

Literature.

* *Kehler*, Dissert. Konigsberg, 1904.
† *De Zeeuw*, Centralb. für Bakt. 31, p. 4.
‡ *Pinoy & Magrou*, Bull. Soc. Bot. France. 12, n.s., p. 609.

XXX.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS LXXIII.

721. **Rourea breviracemosa**, *Gamble* [Connaraceae-Connareae]; *R. caudatae*, Planch., affinis, foliolis numerosioribus haud caudatis et racemis multum brevioribus differt.

Frutex erectus vel scandens, ramulis gracilibus angulatis. *Folia* imparipinnata, ad 20 cm. longa; foliola alterna, distantia, circa 10–12, lanceolata, apice obtuse acuminata, basi cuneata, glabra, 4–7 cm. longa, 2–2·5 cm. lata, nervis utrinque 4–5, reticulatione areolata; petioluli 1–2 mm. longi. *Racemi* axillares, 1–1·5 cm. longi, 8–10-flori; bracteae minutae, subulatae, cum rhachi serico-puberulae; pedicelli graciles, 5 mm. longi. *Calycis* lobi 5, linear-oblongi, glabri, 6 mm. longi. *Corollae* lobi viriduli, oblanceolati, calycis lobis latiores, paullo breviores. *Stamina* 10; filamenta gracilia, 3–4 mm. longa, basi incrassata et annulum formantia; antherae orbiculares, connectivo lato conspicuo. *Carpella* 5, ovoidea; styli extrorsum curvati; stigmata capitata; ovula 2. *Fructus* ignotus.

Indo-China. Southern Shan States: Kengtawng; at Möng-Nai, trans-Salween, at about 700 m. altitude in old cultivation clearings, *W. A. Robertson* 285, March 1911.

722. **Campanula Robertsonii**, *Gamble* [Campanulaceae-Campanuleae]; *C. sylvaticae*, Wall., affinis, calycis lobis brevioribus, corollae lobis longioribus et foliis brevibus differt.

Herba perennis, ramulis floriferis permultis strictis gracilibus flexuosis albo-hirsutis, radice crassa lignosa. *Folia* alterna, membranacea, lineari-oblanceolata, apice acuta, basi attenuata,

sessilia, margine crenata, scabride albo-hirsuta, 1–1·5 cm. longa, 3–4 mm. lata, nervis utrinque 2–3 obscuris. *Flores* in paniculis paucifloris terminalibus subcorymbosis ; bracteae subulatae, 2–3 mm. longae ; pedicelli filiformes, 1·5–2 cm. longi. *Calycis* tubus turbinatus, albo-hirsutus, 3 mm. longus, conspicue nervosus ; lobi subulati, hirsuti, 2·5 mm. longi. *Corolla* campanulata, pallide caerulea, 7–8 mm. longa, ad mediam partem fissa, lobis acuminatis. *Stamina* 5, 3 mm. longa, antheris acuminatis et filamentis gracilibus basi paullo dilatatis. *Stylus* puberulus, 7 mm. longus, stigmatibus 3 recurvis. *Capsula* ovoidea, apice truncata, basi poris 5 rotundatis dehiscens. *Semina* ellipsoidea, laevia, minuta.

Indo-China. Southern Shan States : Kengtawng ; in crevices of limestone rocks on the banks of the Salween river, at about 200–250 m. altitude, *W. A. Robertson* 248, March 1911.

723. **Taxotrophis triapiculata,** *Gamble* [Urticaceae - Moreae] ; *T. javanicae*, Blume, affinis, foliis conspicue spinoso-serratis emarginatis mucronatis, emarginatura utroque latere spinosa et cum mucrone ideo triapiculata insignis.

Arbor parva, ramosissima, ramulis cinereis ultimis puberulis, stipulis novellorum acuminatis deciduis. *Folia* alterna, coriacea, glabra, ovata, apice emarginata, ob costam productam mucronata et ibi triapiculata, basi cuneata, marginibus cartilagineis conspicue spinosa-serratis raro integris, 4–9 cm. longa, 3–5 cm. lata, costa clavata, nervis utrinque 10–12 rectis parallelis prope marginem arcuatim junctis, nervulis intermediis multis etiam parallelis reticulatione conspicua ; petioli subcrassi, ad 5 mm. longi, juniores puberuli ; stipulae ovato-lanceolatae, brunneae. *Flores* dioici : ♂ in spicas sessiles axillares 1–2 cm. longas congesti ; rhachis carnosa ; bracteae obtusae, puberulae, ciliatae, 1·5 mm. longae, vix 2 mm. latae, flores 1–2 sessiles amplectentes ; perianthii lobi 4, ovati, hyalini, 1 mm. longi ; ♀ in racemis 1–3-floris axillaribus pedunculatis puberulis ; pedunculi circa 3–4 mm. longi, bracteolis parvis distantibus ; pedicelli 1 mm. longi ; perianthii lobi 4, crassi, 2 exteriores oppositi, 2 interioribus paullo longiores, omnes ovarium arcte amplectentes. *Stamina* 4, perianthii ♂ lobis opposita ; antherae orbiculares, introrsae ; filamenta 2 cm. longa, sub pistillo rudimentario 4–lobo affixa. *Ovarium* ovoideum ; stylus lateralis, brevissimus, cito in stigmata 2 subulata 2 mm. longa divisus ; ovulum unum, sub styli basi pendulum. *Fructus* non visus.

Indo-China. Southern Shan States : Kengtawng ; Möng-Nai, along streams in damp limestone gravel, 240 m., *W. A. Robertson* 254 to 257, March 1911. Cochinchina : Prov. Bien Hoa, "ad montem Lu, " *Pierre* 3281, March 1877.

724. **Bomarea alpicola,** *Kränzl.* [Amaryllidaceae-Alstroemerieae] ; *B. Caldasianae*, Herb., affinis, a qua differt partibus omnibus multo minoribus, pubescentia densiore, floribus vix ¼ illius speciei aequantibus.

Caulis (summitas tantum adest) valde tortus, satis dense pilosus, distanter foliatus. *Folia* brevissime (circiter 1 mm.) petiolata, oblonga, acuta, subcoriacea, valde nervosa, petiolo torto et facie infera folii dense pilosa, cum petiolo ad 2·2 cm. longa, 0·8-1 cm. lata. *Bracteae* numerosae, dense aggregatae, oblongae, utraque

facie dense pilosae, ad 1 cm. longae, pedicellos vix 1 cm. longos dense pilosos simplices ebracteolatos superantes, reflexae. *Flores* succedanei, vix 15 in umbellam parvam 2·5 cm. longam congesti, purpurei mihi visi sunt, ringentes, alabastris compluribus floribus interpositis. *Sepala* obovato-oblonga, glabra, apice obtusa, 1 cm. longa, circiter 3 mm. lata. *Petala* ex ungue angustissimo ciliato supra dimidium subito dilatata, subrhombea, 1·4 cm. longa, antice obtusangula, 6–7 mm. lata. *Ovarium* obconicum, dense pilosum.

COLUMBIA. Fuquieres, 3000–3600 m. Received from Messrs. Sander and Sons, St. Albans, Herts.

The species is difficult to characterise. Technically it is near to *B. Caldasiana*, but it is of a much smaller size than even the most depauperated specimen of this species. Also the hairiness is everywhere denser except in the flowers which are glabrous but for a short portion of the claw of the petals. To judge from dried specimens of other species the colour of the flowers has not been yellow or orange but purplish. The plant described above may be the same as a specimen received from Sander and Sons, gathered at Pasto, and referred by Mr. J. G. Baker to *B. Caldasiana*.

725. **Bomarea calyculata**, *Kränzl.* [Amaryllidaceae-Alstroemerieae]; differt a *B. formosissima*, Griseb., cui similis, bracteis magnis numerosis calycem exteriorem formantibus et petalis apice non retusis sed breviter et obtuse acutatis.

Caulis certe altus, volubilis, ubique glaber, apicem usque foliatus. *Folia* ovato-oblonga, acuta vel acuminata, brevipetiolata (petiolis 5 mm. longis vix tortis), supra glabra, subtus sub lente valido in nervis minute pilosa, ad 9 cm. longa, ad 2·5 cm. lata; folia infrafloralia ad 12, dense congesta, caulinis simillima nisi minora, 6–7 cm. longa, 2 cm. lata. *Umbella* simplex, circiter 20-flora; pedicelli tenuissimi, simplices, glabri, circiter 2 cm. longi, quam flores manifeste breviores, haud bracteolis obsiti. *Flores* 4 cm. longi; sepala petalaque omnino aequilonga, glabra. *Sepala* obovato-lanceolata, apice obtusa, 4 cm. longa, 1 cm. lata. *Petala* a basi dimidium usque linearia, deinde rhombeo-spatulata, haud retusa, triangula, obtuse acutata, circiter 1 cm. lata. *Filamenta* tenuissima, glabra, perigonii phyllis vix breviora. *Ovarium* obconicum, profunde sulcatum, 3 mm. longum, glabrum.

BOLIVIA. *Pearce* 205. Presented by Messrs. Veitch 1884.

Mr. J. G. Baker is certainly right in comparing this plant with *B. formosissima*, Griseb., but it also shows strong resemblances to *B. superba*, Herb., being to a certain degree intermediate between the two species. It agrees with Mr. Herbert's plate of *B. superba* in the flower but has much larger and broader leaves. It also agrees fairly well with Mr. Baker's description of *B. superba* ("The Handbook of the Amaryllideae," p. 153) but differs in the absence of hairs especially in the flowers and inflorescence. It has the habit and compact inflorescences of *B. formosissima*, Griseb., the petals of which are, however, different.

726. **Bomarea foliolosa**, *Kränzl.* [Amaryllidaceae-Alstroemerieae]; *B. multiflorae*, Mirb., haud dissimilis, differt caule tenuiore, foliis parvis numerosis, floribus majoribus paucis.

Caulis volubilis, circiter 2·5 cm. diametro, in parte suprema 36 cm. longa glaber, foliis undique aequaliter vestitus. *Folia* parva,

brevipetiolata, subtus et supra glabra, subtus pallidiora, cum petiolo torto undulato 5 mm. longo ad 5·5 cm. longa, ovato-lanceolata, acuta vel acuminata, 1·5 cm. lata, suprema minora, inflorescentiam fere attingentia. *Bracteae* crebrae, lanceolatae, acutae, reflexae, subtus minute puberulae, 2 cm. longae ; pedicelli ad 10, simplices, haud bracteolati, breviter denseque puberuli, 1·5 cm. longi, quam flores bene breviores. *Flores* vix penduli, purpurei esse videntur. *Sepala* ligulata vel anguste lineari-oblonga, obtusa, extra praesertim apice brevipilosa, 2·5 cm. longa, 4 mm. lata. *Petala* aequilonga, ex ungue lineari-canaliculato piloso spatulata, antice rotundata, medio apiculata. *Filamenta* dimidium usque brevipilosa quam phylla paululum breviora. *Ovarium* subsemiglobosum, dense puberulum.

COLOMBIA. Near Bogota, flowering in October, *Holton* 146.

The plant shows some resemblance to *B. multiflora*, Mirb. (a rather badly defined species), but the sepals and petals are of exactly the same length and the number of flowers is very limited. It should be placed among the small species. It also shows some superficial resemblance to *B. acutifolia*, Herb., but this has leaves less than one third of the length and still fewer flowers.

727. **Bomarea Mooreana**, *Kränzl.* [Amaryllidaceae-Alstroemeriae] ; nulli affinior, differt ab omnibus statura parva, caule superne aphyllo ceterum folioso, floribus angustis fere tubulosis.

Caulis volubilis, tenuis, glaber, crassiusculus ; pars quae praestat, circiter 30 cm. longa, superne per 11 cm. aphylla, squamulis 1 vel 2 praedita, ceterum foliis 25–30 parvis obsita. *Folia* brevipetiolata, lanceolata vel ovato-lanceolata, longe acuminata, membranacea, griseo-viridia (viva glaucescentia?) supra glabra, subtus praesertim in nervis dense pilosa, cum petiolo torto 5 mm. longo utplurimum 7 cm. longa, 1·5 cm. lata ; bracteae inflorescentiae minutae, externae lineares, internae filiformes ; pedunculi circiter 6, tenues, 5–7 cm. longi, 1–3-flori, glabri, bracteolis parvis obsiti ; pedicelli denique filiformes, partim necnon ovaria sepalaque dense vel praesertim in alabastris densissime pilosa. *Flores* phyllis omnibus arcte conniventibus parallelis, tubulosi, penduli. *Sepala* ligulata, obtusa, antice paululum latiora, pulchre reticulata, 1·8 mm. longa, 4 mm. lata. *Petala* subpandurata, infra dimidium leviter contracta, apicem versus spatulata, sensim dilatata, apice obtuse acutata, basin versus haud multum angustiora, linea dorsali dense villosa a basi apicem usque instructa, 2·2 cm. longa, antice 6 mm. lata. *Stamina* longa ; antherae petala exedentes ; stylus multo brevior.

Origin unknown. It flowered at Glasnevin in 1908. This is the smallest species of *Bomarea* yet described and stands in marked contrast to its larger congeners. The petals being clearly longer than the sepals and the pedicels being much branched, the species belongs to Mr. Baker's last section which contains only four species all without exception very large plants. The flowers are white in the dry state suffused with rose at the tips and have anastomosing rose veins.

728. **Zephyranthes filifolia**, *Kränzl.* (descr.) ; *Herb.*, ex *Baker*, Handbook of Amaryllideae, 1888, p. 33 (nomen). [Amaryllidaceae-Amaryllideae] ; a *Z. depauperata*, Herb., statura minore, foliis omnino

capillaceis (nec linearibus), pedunculo crassiusculo satis firmo, pedicello vaginaque brevioribus, perigonii segmentis lanceolatis usque oblongis recedit.

Bulbi non visi ; pars inferior caulis cataphyllis paucis brunneis vestita. *Folia* filiformia vel potius capillacea, ad 10 cm. longa, vix 0·5 mm. lata. *Scapus* sine flore ad 8 cm. altus, crassiusculus, medio interdum leviter incrassatus (semper ?), in apice ipso paululum dilatatus, semper (certe in speciminibus 12 visis) monanthus. *Vagina* pedicellum et ovarium necnon partem basilarem perigonii includens, pellucida, tenuiter pergamacea, acuminata, 2·2 cm. 'onga ; pedicellus circiter 1 cm. longus. *Flores* lutei, illis *Gageae pratensis* nostrae subsimiles. *Perigonii* tubus brevissimus, vix 2 mm. longus. *Sepala* lanceolata, acuta, 1·8–2 cm. longa, 3 mm. lata. *Petala* oblongo-lanceolata, aequilonga, acuta, 1·8–2 cm. longa, 5–6 mm. lata. *Stamina* fundo tubi inserta, 4 mm. longa. *Ovarium* 7 mm. longum, 4 mm. crassum ; stigmata 3, valde torta.

Patagonia. Found in gravel, sand and clay, *W. Andrews*.

Mr. J. G. Baker in his " Handbook of the Amaryllideae " p. 33, says that the specimens of this plant agree in all characters, except the size, with a drawing of Mr. W. Herbert's inscribed *Z. filifolia*, and on the sheet to which the specimens are glued is a short note in Mr. Baker's handwriting to the same effect. Although the name until now was a nomen nudum I have accepted it and publish here a diagnosis.

729. **Collania Jamesoniana**, *Kränzl.* [Amaryllidaceae-Amaryllideae]; *C. andinamascanae*, Herb., proxima, a qua floribus bene minoribus, foliis brevioribus et ab omnibus adhuc descriptis bracteolis in ipsa basi pedicellorum differt.

Caulis summitas tantum adest 12 cm. longa, glabra, profunde sulcata, satis dense foliata. *Folia* 1·8 cm. inter se distantia, patentia vel deflexa, crasse coriacea, rigida, in alterum latus versa vel torta, lineari-oblonga, brevi-acutata, margine revoluta, supra et subtus glabra, 5 cm. longa, circiter 7 mm. lata, suprema dense congesta, breviora latioraque, 3–4 cm. longa, ad 1 cm. lata, reflexa. *Inflorescentia tota* umbellata, cum parte suprema caulis subnutans, minime deflexa, circiter 10-flora ; bracteae tenues, oblongae, coloratae (?), 6–8 mm. longae, quam pedicelli simplices torti glabri 2·5 cm. longi multo breviores. *Flores* succedanei ; perigonii phylla aequilonga, 3·2 cm. longa, extra glabra, ut videtur rubra, apicibus rubris. *Sepala* late oblonga, breviter et obtuse acutata, 3 cm. longa, 9 mm. lata. *Petala* basi angusta haud vel vix canaliculata sensim dilatata, cuneata, antice obtusangula, leviter crenulata, apiculata, 1 cm. lata. *Stamina* paulo tantum breviora. *Ovarium* obconicum, glabrum.

Ecuador. *Jameson* 164.

This species resembles at first sight the drawing of *C. andinamascana*, Herb., in his work on the Amaryllidaceae, plate 8, but the flowers are a good deal smaller and there are real bracts at the base of the flower stalks, a character never before observed in *Collania*. The leaves also are nearly blunt and not acuminate as in *C. andinamascana*.

730. **Crinum Stapfianum**, *Kränzl.* [Amaryllidaceae-Amaryllideae]; a *C. podophyllo*, Baker, cui habitu et magnitudine florum haud

dissimile, floribus longe pedicellatis floribusque in tertia tantum parte basilari in tubum connatis recedit.

Bulbi globosi, 8 cm. diametro, in collum 5–6 cm. longum 3 cm. crassum producti. *Folia* desunt. *Pedunculus* ut videtur anceps, certe compressus, 20–30 cm. altus, in speciminibus omnibus (4), quae examinavi, biflorus, spatha sub anthesi basin usque bipartita, parte utraque triangulari ad 5 cm. longa ; bracteae florales tenerrimae, lineares, pedicellos florum 4–6 cm. longos basi saepius valde incrassatos longe non aequantes. *Perigonium* ad 12 cm. longum, infundibuliforme, in orificio 4 cm. diametro, certe album ; tubus tertiam circiter partem totius aequans, deinde divisus, segmentis sensim divergentibus. *Sepala petalaque* subaequilonga, lanceolato-obovata, petala sublatiora, teneriora, omnia acuta. *Stamina* 4–5 cm. longa, orificium floris non attingentia. *Ovarium* breve, ellipsoideum vel elongato-obovatum, 1·2 ad 1·5 cm. longum. *Stylum* non vidi.

Brazil. Chiefly Province of Goyaz, *Glaziou* 22,204.

This species of which I have seen four specimens resembles at first sight *C. americanum*, L. or *C. erubescens*, Ait., both of which are known for their tendency to vary in all parts. It has also a certain resemblance, especially in its two flowered inflorescences to *C. podophyllum*, Baker. The most striking feature and one by which it can be distinguished from all other species is the long flower-stalk, which is 5 to 6 cm. (2¼ inches) in length. The tube of the flower is comparatively short, surely shorter than in the three species quoted above. It is divided into six segments from a little above the basal third, the segments diverging gradually to form a rather narrow funnel. The colour is undoubtedly white.

XXXI.—MISCELLANEOUS NOTES.

Gift of Orchids by Sir George Holford.—The Kew collection of orchids has recently been greatly enriched by the gift of about 150 large plants of Cattleya, Laelia, Laelio-Cattleya, Brasso-Cattleya, Cymbidium and Cypripedium by Lt.-Col. Sir George Holford, from his famous collection at Westonbirt. While the collection of orchids cultivated at Kew must be essentially botanical, its main object being to represent the family in as comprehensive a way as possible, the great progress made in recent years in the breeding of hybrids, many of which are botanically interesting as well as possessed of exceptional claims as garden plants, necessitated the addition of a selection of them to the collection. Increased accommodation was provided last year by the erection of an intermediate house adjoining the T Range, and, thanks to Sir George's generosity, Kew now possesses some of the best of the Cattleyoid hybrids.

Resting Spores of Phytophthora infestans.—The question of the production of oospores by the Potato Blight fungus, *Phytophthora infestans*, has long been the subject of investigation. Though the

presence of resting spores in the diseased tissues of the potato plant has been recorded by various writers, the connection of these bodies with *Phytophthora* was more than doubtful, and owing to the difficulty of cultivating the fungus as a saprophyte investigators were unable to check the point by the pure-culture method.

During the last decade considerable advance has been made in the successful artificial cultivation of *P. infestans*, workers both on the continent and in America having succeeded in preparing media on which it grows readily as a saprophyte. Conidia were obtainable in abundance, but in most cases no traces of sexual organs or oospores could be discovered. In 1911, however, Clinton recorded the production of oospores in a medium derived from oats (oat-juice agar), and noted also the presence of antheridia and oogonia. Corroboration of this discovery was highly desirable, and the matter was taken in hand the same year by Pethybridge and Murphy at the Clifden Experiment Station in Ireland. Their report on the subject is now published.* It contains an account of pure cultures on various substrata, and of the production of sexual organs and oospores on a special oat medium. Clinton's results are fully confirmed, and some new points, especially with regard to the development of the spores, are brought to light.

The medium on which antheridia and oogonia were induced to form was ground Quaker Oats agar. On this the fungus grows vigorously, and after producing a luxuriant crop of conidia develops oospores readily and freely. The oospores arise as the result of the apparent fertilization of the oogonia by antheridia, their development following the process described by Pethybridge for *P. erythroseptica*. The spores measure 28–30μ in diameter, and the wall is 2–4μ thick. On Clinton's oat-juice agar oospores were produced parthenogenetically in the absence of antheridia, and the same phenomenon also took place to a large extent in the Quaker Oats cultures. In the case of the latter the authors believe that the formation of antheridia is a matter of time, and that with prolonged culture these bodies will invariably appear. Clinton found that in the absence of antheridia, the oogonia did not develop further than the oosphere stage, but in the Irish cultures many of the oogonia undoubtedly produced thick-walled, parthenogenetic oospores.

Every precaution was taken by Pethybridge and Murphy to exclude foreign organisms, and there can now be no doubt whatever that *P. infestans* is capable of forming antheridia and oogonia from which resting spores arise. The important question as to whether the fungus produces oospores in *Solanum* is one to be settled by further research, but now that the spores are known and described, it will be possible to compare with them the various thick-walled spores known to occur in different parts of the diseased potato plant.

A. D. C.

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* On Pure Cultures of Phytophthora infestans, De Bary, and the Development of Oospores. By G. H. Pethybridge and Paul A. Murphy. Sci. Proc. Roy. Dublin Soc., vol. xiii, No. 36, March 1913, pp. 566–588.

Copal from the Congo.—In a recently issued Diplomatic and Consular Report on the Trade and Resources of the Congo for the year 1911, Mr. Consul Lamont gives the following particulars of the industry and of the export trade in this product which has developed considerably during the year:—"The resin is derived in the Congo from *Copaifera Demeusei* and other trees of the leguminous family. It is found principally in the marshy forests bordering the rivers in the districts of Lake Leopold II., Bangala, Equateur, Ubangi, Moyen Congo, Kasai, Stanleyville and Aruwimi that is in the base formerly occupied by the inland sea. Two kinds of gum are found: Fresh copal is collected from the trees and fossil copal dug up from trees that have sunk in decay under the soil. The natives search round the bases of copal-bearing trees with sticks tipped with iron and find it in large quantities. At low water, too, on the sandy river reaches they often find copal. Before exportation it is divided into parcels hard and soft; the former is treated with a solution of caustic soda of 1 per cent. strength for half an hour and is then washed in water and dried in the sun. The softer copals of whitish or yellow texture are of recent formation and are simply scraped before packing; exposed to the air for a certain time they become clearer and harder. The copal of the Congo is classified on the Antwerp market under five heads:—(1) sorted white best quality; (2) sorted clear, transparent; (3) assorted, less transparent; (4) somewhat opaque; (5) not sorted. The exports during the last eight years are as follows:—

	Metric Tons.
1904	938·6
1905	754
1906	912·3
1907	1,060·3
1908	1,618·9
1909	826·5
1910	975·5
1911	2,138·8

The price at Antwerp varies from 6*d.* to 1*s.* 3*d.* per lb.

The natives only use copal for illuminating purposes; in Europe it enters largely into the manufacture of varnishes, the most valuable copals for that purpose being hard and transparent and fracture like glass. The shades of colour are important, as the colour of the varnish depends on them."

De Cordemoy in Ann. L'Inst. Col. Marseille VI., fasc. 2, 1899, p. 251, states that throughout the Congo region more or less copal is collected consisting of two varieties namely, red and white, and that the red form is without doubt afforded by *Copaifera Mopane*, described as a fine forest tree of Lower Guinea and the Mozambique District. The wood is extremely hard, dark, heavy and durable but difficult to work and is known as Iron-wood in the Zambesi. The seeds are reniform or oblong with large resinous glands, easily discernible with the naked eye. J.M.H.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 6.] [1913.

XXXII.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW.—XIV.

(With Plate.)

Agaricaceae.

Laccaria nana, *Massee.* Figs. 17–20. *Pileus* carnosulus, ex hemispherico explanato-concavus, glaber, laevis, cinnamomeo-lividus, subexpallens, margine primitus albo-farinosa, 1 cm. latus. *Lamellae* subdistantes, postice attenuato-adnatae, pallidae, demum albo-pulverulentae. *Stipes* cavus, fibrillosus, albidus, 1 cm. longus. *Sporae* globosae, spinulosae, hyalinae, 15–16 μ. *Basidia* clavata, 2-sterigmatica, 30–35 × 7–8 μ.

Scattered on naked soil under trees. Distinguished from all known species by its small size, large spores and even, glabrous pileus. Q. *I. M.*

Omphalia kewense, *Massee.* Figs. 7–10. *Pileus* carnosulus, cylindraceo-campanulatus, glaberrimus, profunde sulcatus, margine crenatus, ochraceus dein albidus, 3–5 mm. altus. *Lamellae* distantes, membranaceae, subdecurrentes, acie integrae, pallidae. *Stipes* gracilis, teres, fistulosus, plus minus flexuosus, pallidus, 2–3 cm. longus. *Sporae* ellipsoideae, hyalinae, 7 × 5μ. *Basidia* subclavata, 28–32 × 6–7μ.

Gregarious on dead rhizomes in the Filmy fern house.

Remarkable for the deeply grooved, elongated, cylindric-campanulate pileus. Allied to *Omphalia picta,* Fries. *I. M.*

Lepiota gracilenta, *Krombh.*

Very unusual in the grounds. Somewhat smaller in size than *L. procera,* Scop., the "Parasol fungus," and also distinguished by the very fugacious ring. Q. *I. M.*

Mycena atroalba, *Bolton.*

This species is considered as one of the rarities of our flora, but is probably not uncommon, although confused with other black species of *Mycena,* from which it is distinguished by the distinctly swollen base of the stem, glaucous gills and dense mass of bristling, snow-white mycelium at the base of the stem. Q. *I. M.*

(30401—6a.) Wt. 212—780, 1125. 8/13. D & S.

Mycena adonis, *Bull.*
Perhaps our most beautiful *Mycena.* The cap is clear rose-colour and very translucent, remainder snow-white. Gregarious amongst grass. A. *I. M.*

Mycena amicta, *Fries.*
Gregarious, amongst grass under the drip of oak trees. A. *I. M.*

Mycena collariata, *Fries.*
Readily distinguished amongst the smaller species of *Mycena* having a greyish cap, by the gills being attached to a collar free from the stem as in *Marasmius rotula*, Fr. On fallen twigs. Q. *I. M.*

Collybia luteifolia, *Gillet.*
Readily distinguished from every other species of *Collybia* by the sulphur yellow gills and the reddish cap and stem. New to the British flora. On the ground. Q. *I. M.*

Leptonia solstitialis, *Fries.*
Among grass. A. *I. M.*

Galera ovalis, *Fries.*
A very beautiful fungus, cap rich chestnut-brown, becoming pale buff when dry.
In tufts on dung. A. *I. M.*

Naucoria abstrusa, *Fries.*
A small brown fungus, commonly confused with the very common *Naucoria melinoides*, which differs in having a striate, dry cap, whereas in *N abstrusa* the cap is even and viscid. Among grass. A. *I. M.*

Hebeloma versipelle, *Fries.*
Under conifers. A. *I. M.*

Hebeloma testaceum, *Batsch.*
A large fungus with a brick-red cap and rust-coloured gills. Smell strong, like radishes.
On the ground. A. *I. M.*

Coprinus domesticus, *Fr.*
Growing abundantly on an old charred stump in Queen's Cottage grounds. The plant was first observed on June 11th, 1912, after which the stump was kept under observation, and it was found that fresh fruit bodies of the fungus came up continuously until the last week of August, by which time the mycelium seemed to be exhausted. *E. M. W.*

Polyporaceae.

Polystictus Wynnei, *Berk. and Broome.*
Forming thin, variously shaped expansious incrusting fallen branches, leaves, etc. When growing the colour is pale yellow, becoming primrose-yellow towards the edge. Dull ochre when dry. A. *I. M.*

Poria Vaillantii, *Fr.*
Forming large, easily separable sheets on some old planks. Q. *E. M. W.*

Thelephoraceae.

Peniophora longispora (*Pat.*) *v. Höhn.*

New to Britain. The species was originally described from Tunis, but is apparently not uncommon in Europe on bark and wood of various trees, having been recorded from Austria, Poland, and France.

It is a very marked species, with the habit of a *Hypochnus*, and differing from all other Peniophoras in its long, very slender spores, 12–17 × 2–2½μ. Q. *E. M. W.*

Corticium confine, *Bourd.* et *Galz.*

First described from France in 1911, but apparently not uncommon in Britain. Common in the grounds of Queen's Cottage on wood and bark of various trees. It is a thin, white species, superficially resembling young states of *Hydnum farinaceum*, with which it has probably hitherto been confused. Q. *E. M. W.*

This and the following species of *Corticium* were first added to the British Flora during the past year, but all appear to be fairly generally distributed, having been received from correspondents in various parts of the country.

Corticium botryosum, *Bres.*

Forming a thin, glaucous film resembling a mould, on very rotten wood. Q. *E. M. W.*

Distinguished from the following by the absence of clamp-connections at the septa.

Corticium subcoronatum, *v. H.* et *L.*

Occurs more commonly than *C. botryosum*, in similar situations, and has the same general appearance. Q. *E. M. W.*

Corticium albo-stramineum (*Bres.*) *Wakefield. Hypochnus-albo-stramineus*, Bres.

On fallen branches. Q. A. *E. M. W.*

Distinguished by the large, broadly-elliptical or subglobose spores, with dense, granular contents, which sometimes causes the epispore to appear slightly rough, and also by the presence of laticiferous (?) hyphae, with deeply staining contents ("gloeocystidia"). The latter character would place it in the genus Gloeocystidium of some Continental authors, but it is thought that the presence of these bodies alone in certain species of Corticium and Peniophora hardly justifies their separation as distinct genera.

Sphaeriaceae.

Clypeosphaeria Notarisii, *Fuckel.*

On dead bramble shoots. Q. *I. M.*

Pezizaceae.

Peziza adae, *Sadler.*

A very beautiful fungus, at first cup-shaped then gradually expanding until saucer-shaped or almost flat, with an irregularly wavy edge. Cream colour, more or less tinged with deep rose. The largest specimen was three inches in diameter. On soil in propagating pit. *C. P. R.*

Melanconiaceae.

Gloeosporium Crotolariae, *Massee*.

Maculae amphigenae, determinatae, primo suborbiculares dein irregulares, fuscescentes, saepius centro cinerascentes. *Acervuli* subcutanei dein erumpentes, roseo-tincti. *Sporae* oblongo-ellipticae, utrinque rotundatae, hyalinae, 25–28 × 7–8μ, in sterigmatibus hyalinis solitariae acrogenae.

Parasitic on young shoots of *Crotolaria juncea*, L., Sunn hemp. Small, more or less circular brownish patches first appear on the young shoots, these gradually increase in size and encroach on each other forming irregular patches. Just before the spore masses burst through to the surface, the central portion of the patches present a greyish appearance, due to the upraising of the cuticle. Brown patches appeared five days after the application of spores to the unbroken surface of the shoot.

Colletotrichum concentricum, *Massee*. Figs. 14–16.

Maculae amphigenae, effusae, arescenti-albae, eximie determinatae. *Acervuli* maculas totas occupantes, circinatim vel concentrice dispositi, aggregati, aurantiaci. *Sporae* ellipticae, utrinque rotundatae, rectae vel inaequilaterales, 21–28 × 7–8μ, hyalinae, in sterigmatibus filiformibus, hyalinis acrogenae. *Setulae* rectae, acuminatae, atro-brunneae, opacae, 80–100 × 6–7μ.

On the fruit of the Snake gourd, *Trichosanthes anguina*, L., in the Lilyhouse.

A destructive parasite forming large bleached patches on the fruit, which become covered with irregularly concentric rings of orange spore-masses. Spores placed on the unbroken surface of the fruit produced no result, but when introduced into the flesh on the point of a needle, the bleaching of the surface was apparent on the fourth day, and on the ninth day the orange spores, mixed with blackish spines, ruptured the epidermis and appeared on the surface of the fruit. *G. M.*

Hendersonia rubi, *Westend*. Figs. 11–12.

Forming whitish patches on the living shoots of brambles. This fungus has recently attacked cultivated raspberries and loganberries, and is a source of serious trouble in some parts of the country. The canes are attacked while quite young, and the presence of the fungus usually causes sterility. Q. *I. M.*

Hyphomycetaceae.

Brachysporium Wakefieldiae, *Massee*. Fig. 13.

Maculae sparsae, majusculae, villosulae, olivaceae. *Hyphae* cylindraceae, flexuosulae, simplices vel ramulosae, hic inde parce noduloso-geniculatae, septatae, olivaceae. *Conidia* acrogena, cylindrico-ellipsoidea, apice obtusata. laevia, 3-septata, loculis tribus internis obscure olivaceis, extimis pallidioribus, chlorinis, 23–25 × 7–8μ.

Forming scattered, olive coloured patches on the hymenium of a species of *Corticium*. Agreeing with *Brachysporium apicale*, Sacc., in having the apical cell of the conidium paler than the remainder, but distinguished by the much larger spores. Q. *E. M. W.*

Stemmaria aeruginosa, *Massee*. Figs. 1–3.

Stipes cylindraceus, erectus, ex hyphis tenuis septatis compositus, flavidus, circa 2 mm. longus, supra scopulato-ramosus, capitulum aeruginosum formans. *Conidia* concatenata, ellipsoidea, continua, flavida, 7 × 4μ, floccos moniliformes ex nodulis ramorum oriundos formantia.

On bird dung. First found by the late Mr. G. Nicholson, and recently met with again on the same substratum. Differs from *Stemmaria globosa*, Preuss, by the chains of conidia originating laterally, and in the smaller conidia. Q.

Arthrosporium elatum, *Massee*. Figs. 4–6.

Stipites gregarii saepe caespitulosi ac basi confluentes, cylindracei vel sursum subattenuati, apice penicillato-expansi, contextu fibroso-fasciculato flavo-brunneo, 0·5–1 mm. alto. *Conidia* hyalina, oblongo-clavata, 1-septata, 12–15 × 3μ.

This differs from typical species in having 1–septate spores, but conforms in all other respects.

On decaying fragments of grass. Q. *G. M.*

Explanation of figures on plate.

1. *Stemmaria aeruginosa*, Massee. Entire fungus, mag.
2. Portion of fertile branch of same, mag.
3. Portion of fertile branch of same, showing origin of chains of spores, mag.
4. *Arthrosporium elatum*, Massee, group of fungi, mag.
5. Fruiting head of same, mag.
6. Conidia of same, mag.
7. *Omphalia kewense*, Massee, nat. size.
8. Pileus of same, mag.
9. Section of pileus of same, mag.
10. Basidium and spore of same, mag.
11. *Hendersonia rubi*, Westend., on bramble stem, nat. size.
12. Spores of same, mag.
13. *Brachysporium Wakefieldiae*, Massee, spores mag.
14. *Colletotrichum concentricum*, Massee, fungus nat. size.
15. Spores and hymenial spine of same, mag.
16. Spores of same, mag.
17. *Laccaria nana*, Massee, fungus, mag.
18. Section of same, mag.
19. Basidium and spores of same, mag.
20. } Spores of same, mag.
20.* }

XXXIII.—CONTRIBUTIONS TO THE FLORA OF SIAM.

ADDITAMENTA, IV.

Lonicera siamensis, *Gamble* [Caprifoliaceae-Lonicereae]; *L. macranthae*, DC., affinis, foliis conspicue rugosis acutis nec acuminatis, corollae lobis brevibus latis et staminibus vix exsertis differt.

Frutex supra arbuscula vagans (ex *Kerr*), ramulis gracilibus fuscis molliter velutinis. *Folia* ovato-oblonga vel ovato-lanceolata, apice acuta et mucronata, basi cordata, 9–11 cm. longa (vetustiora forsan

majora), circa 4·5 cm. lata, chartacea, supra nitida, glabra, ob nervationem impressam bullosa, infra, praecipue ad nervos, molliter pubescentia, juniora supra ad nervos puberula, pallida, costa gracili ; nervi laterales utrinque 5–6, curvati, nervulis multis subparallelibus inter se juncti, reticulatione areolata ; petiolus subcrassus, 5–7 mm. longus, velutinus ; ad nodos ramulorum supra folia foliola 2, minima, ovata. *Flores* albi, tandem flavescentes (ex *Kerr*), ad foliorum axillas bini, pedunculis 1–2 cm. longis ; bracteae lanceolatae, 2 mm. longae, pubescentes ; bracteolae ovatae, obtusae, vix 1 mm. longae. *Receptaculum* ovoideum, 2–3 mm. longum, fere glabrum. *Sepala* 5, triangularia, vix 1 mm. longa, pubescentia. *Corollae* tubus gracilis, cylindricus, 3–4 cm. longus, puberulus ; lobi 5, quorum 4 brevissimi, 1-2 mm. longi et par exterius interioribus latius, quintus longior, angustior, recurvus. *Stamina* vix exserta, antheris oblongis 3·5 mm. longis. *Stylus* filiformis, staminibus aequilongus ; stigma capitatum. *Fructus* ignotus.

Doi Wao, 1050 m., *Kerr* 2457.

Wendlandia floribunda, *Craib* [Rubiaceae-Rondoletieae] ; ab affini *W. glabrata*, DC., floribus congestis, alabastris apice pilosis, corollae tubo graciliore recedit.

Arbor circiter 7·5 m. alta (ex *Kerr*) ; ramuli brunneo-corticati, internodiis brevibus. *Folia* oblanceolata, oblongo-oblanceolata vel elliptica, apice breviter acuminata, obtusiuscula, basi cuneata, 6–11·5 cm. longa, 2·6–4·3 cm. lata, coriacea, glabra, nervis lateralibus utrinque 6–8 supra conspicuis subtus prominentibus, nervis transversis uti reticulatione graciliore pagina utraque subconspicuis, petiolo 5–14 mm. longo glabro suffulta ; stipulae diutius persistentes, apice cuspidato-subulato-acuminatae, basi 3 mm. latae, ad 4·5 mm. longae. *Panicula* terminalis, multiflora, ad 1·4 cm. longa et 1·3 cm. diametro ; bracteae lineares, acutae, ad 2 mm. longae ; flores sessiles vel perbreviter pedicellati. *Receptaculum* glabrum, 1 mm. altum. *Calycis* lobi deltoidei, acutiusculi, 0·5 mm. longi, pauci-ciliati. *Corolla* alabastro apice rotundata truncatave pilosaque ; tubus 3·5 mm. longus, extra glaber, intra parce pilosus ; lobi 0·5 mm. longi, circiter 0·5 mm. lati. *Antherae* sessiles, 0·75 mm. longae. *Stylus* 4 mm. longus, glaber, stigmatibus validis.—*W. glabrata*, DC., var. *floribunda*, Craib in Kew Bull. 1911, p. 386, et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 100.

Chiengmai, Doi Sootep, in open jungle, 1440 m., *Kerr* 1674.

Jasminum Vanprukii, *Craib* [Oleaceae-Jasmineae] ; ab *J. coarctato*, Roxb., cui affine, foliis majoribus, corollae puberulae lobis brevioribus latioribus inter alia differt.

Frutex scandens, cortice mox pallido (fide *Luang Vanpruk*), ramulis statu juvenili crispatim puberulis. *Folia* opposita vel subopposita, ima basi ramulorum fere ad squamas reducta, mediana suborbicularia vel late ovata, suprema oblonga vel oblongo-obovata, omnia parum tantum vel conspicue inaequilatera, apice acute acuminata, basi rotundata vel rotundato-cuneata, ad 16 cm. longa et 7 cm. lata, chartacea, glabra, nervis lateralibus utrinque ad 8 cum costa supra leviter immersis subtus prominentibus, nervis transversis supra conspicuis subtus prominulis, petiolo vix 1 cm. longo breviter pubescente suffulta. *Inflorescentia* terminalis, pedunculo communi

4·5–6 cm. longo puberulo suffulta, e cymis trifloris racemosim dispositis constituta ; bracteae anguste ellipticae vel ovato-lanceolatae, apice longe cuspidatim acuminatae, ad 1·8 cm. longae et 9 mm. latae ; cymulae pedunculo 8 mm. longo suffultae ; bracteae ad cymularum bases oblanceolatae, acuminatae, calycem subaequantes. *Calyx* extra puberulus, 8 mm. longus, lobis tenuibus tubo subaequilongis. *Corolla* alba (ex *Luang Vanpruk*), extra puberula ; tubus 2·5 cm. longus, vix 2 mm. diametro ; lobi circiter 8 mm. longi, 5 mm. lati.

Hui Ché, 300 m., *Luang Vanpruk* 315.

Aeschynanthus Garrettii, *Craib* [Gesneraceae-Cyrtandreae] ; ab *A. micrantha*, C. B. Clarke, floribus majoribus recedit.

Ramuli primo rubro-brunneo- mox pallide corticati, circiter 2·5 mm. diametro. *Folia* opposita, ovato-lanceolata, lanceolata, oblanceolata vel obovato-oblanceolata, apice obtuse acuminata, basi cuneata vel late cuneata, rarius rotundata, 2–7·2 cm. longa, 1·1–2·5 cm. lata, coriacea, nervis lateralibus utrinque circiter 4 plerumque omnino obscuris, costa supra impressa subtus prominente, pagina utraque glabra, margine undulata, recurva, petiolo 2–6 mm. longo supra canaliculato glabro suffulta. *Flores* axillares, solitarii ; bracteae parvae, deciduae ; pedicelli glabri, sub anthesin 1·1 cm. longi, infructescentes ad 1·8 cm. longi, paulo incrassati. *Sepala* libera, lineari-lanceolata, acutiuscula, inter se parum inaequalia, ad 7 mm. longa et 1·25 mm. lata, glabra, uninervia. *Corolla* 3·1 cm. longa, lobis exceptis glabra ; tubus ad 2·5 cm. longus ; labium superum rectum, e lobis duobus apice rotundatis circiter 3 mm. longis et 4 mm. latis constitutum ; lobi laterales reflexi, circiter 5 mm. longi et lati ; lobus anticus patens, 8 mm. longus, 5 mm. latus, lobis omnibus pilis septatis glanduloso-capitatis ciliatis. *Filamenta* ad 3·2 cm. longa, superne praecipue glanduloso-pilosa, antheris 2 mm. longis. *Ovarium* 1·5 cm. altum, glabrum, stipite 1 cm. longo suffultum ; stylus 1·4 cm. longus. *Fructus* ad 6 cm. longus, stipite 2·5 cm. longo suffultus ; semina pilo solitario utrinque instructa.

Doi Intanon, Pah Ngeam, west side of north rocks, 2080–2115 m., *Garrett* 86.

Aeschynanthus lineatus, *Craib* [Gesneraceae-Cyrtandreae] ; *A. Garrettii*, Craib, similis sed foliis majoribus, corolla minore eiusque lobis brevioribus satis distat.

Ramuli primo rubro-brunneo-corticati, mox pallidi, glabri, circiter 2·5 mm. diametro. *Folia* opposita, plerumque parum inaequilatera, lanceolata, oblonga, oblanceolata vel obovato-oblanceolata, apice acuminata, obtusiuscula, basi cuneata vel late cuneata, 4·8–9·3 cm. longa, 1·7–3·3 cm. lata, coriacea, pagina utraque glabra, nervis lateralibus obscuris, costa supra leviter impressa subtus prominente, petiolo 0·5–1·5 cm. longo supra canaliculato suffulta. *Flores* axillares, plerumque gemini ; pedicelli 7–10 mm. longi, glabri, bracteis parvis deciduis basi instructi. *Sepala* libera, linearia, obtusiuscula, ad 6·5 mm. longa et 1·25 mm. lata, glabra. *Corolla* ad 2·8 cm. longa, extra, superne praesertim, pilis transverse septatis glanduloso-capitatis instructa ; tubus ima basi circiter 2 mm., apice fere 8 mm. diametro ; lobi inter se subaequales, oblongi, apice rotundati, ad 2·5 mm. longi et lati, pilis transverse septatis glanduloso-capitatis parce ciliati,

utroque linea atro-rubra fere ad tubi medium decurrente inferne gradatim angustata medio ornato. *Filamenta* ad 3 mm. longa, antheris circiter 1·5 mm. longis. *Discus* ovarii stipitis basem laxe cingens, circiter 0·75 mm. altus. *Ovarium* circiter 1·2 cm. altum, glabrum, stipite fere 6 mm. longo gracili suffultum ; stylus 1·4 cm. longus, glanduloso-pilosus.

Doi Intanon, Pah Ngeam, west side of north rocks, 2090 m., *Garrett* 87.

Ruellia Kerrii, *Craib* [Acanthaceae-Ruellieae] ; a *R. suffruticosa*, Roxb., corolla majore distinguenda.

Caules prostrati (ex *Kerr*), primo pilis longiusculis divergentibus albis densius tecti, plus minusve glabrescentes. *Folia* lanceolata, late lanceolata vel ovato-lanceolata, apice acute acuminata, basi cuneata vel late cuneata, 6–10·5 cm. longa, 2·5–4·4 cm. lata, membranacea vel chartaceo-membranacea, pagina utraque sed inferiore costa nervisque tantum pilis longiusculis albis parce instructa, nervis lateralibus utrinque 5–6 supra conspicuis vel subconspicuis subtus prominulis, nervis transversis supra subobscuris subtus conspicuis, margine integra, ciliata ; petioli foliorum oppositorum parum inaequales, ad 2·2 cm. longi, pilis iis caulium similibus instructi. *Flores* axillares, solitarii, sessiles ; bracteolae geminae, sub anthesin spatulatae, 9 mm. longae, fructu ad 2 cm. (petiolo incluso) longae. *Calycis* tubus 5 mm. longus, lobi e basi circiter 2 mm. lata longe subulato-acuminati, inter se parum inaequales, ad 9·5 mm. longi, pilis subrigidis divaricatis plerumque circiter 1 mm. longis instructi. *Corollae* purpureae (ex *Kerr*) tubi pars basi aequalis 1·3 cm. longa, pars expansa 3 cm. longa ; lobi apice retusi, 1·4 cm. diametro. *Filamenta* glabra, antheris 3·25 mm. longis. *Ovarium* glabrum, stylo 4 cm. longo pilis suberectis albidis sparse instructo. *Capsula* 1·6 cm. longa.—*Ruellia* sp., Craib, Contrib. Fl. Siam in Aberd. Univ. Studies No. 57, p. 153.

Ban Na Gorge, 135 m., in bamboo jungle, *Kerr* 2175.

Daedalacanthus ciliatus, *Craib* [Acanthaceae-Ruellieae] ; a *D. nervoso*, T. And., cui affinis, bracteis ciliatis facile distinguendus.

Fruticulus circiter 30 cm. altus ; caules simplices, primo quadrangulares, mox fere teretes, circiter 2 mm. diametro, crispatim puberuli. *Folia* oblanceolata vel late oblanceolata, apice breviter vel vix acuminata, obtusa, basi cuneata, vel acuminata, 4–9 cm. longa, 1·4–3·4 cm. lata, chartacea, pagina utraque lineolata, glabra nisi subtus costa puberula nervisque lateralibus parce puberula, nervis lateralibus utrinque 6–7 cum costa supra conspicuis subtus prominulis, nervis transversis supra conspicuis subtus subprominulis, petiolo 0·7–1·3 cm. longo supra canaliculato puberulo suffulta. *Spicae* solitariae, terminales, vel raro et axillares, 4–5 cm. longae, ad 2 cm. diametro ; bracteae ovato-lanceolatae, apice subacuminatae vel attenuatae, obtusiusculae vel breviter apiculatae, basi cuneatae, ad 2·2 cm. longae et 8 mm. latae, dorso costa nervisque breviter pubescentes, margine conspicue longe ciliatae, albae, conspicue viridi-nervosae, nervis lateralibus utrinque circiter 6. *Calycis* scariosi tubus 1 mm. longus, lobi lineari-lanceolati, acuti, 3·5 mm. longi. *Corollae* tubus vix 3 cm. longus, lobi ad 8 mm. longi, 6·5 mm. lati. *Ovarium* glabrum, 2·75 mm. altum ; stylus 2·8 cm. longus, pilis brevibus sparse instructus.

Nan, by edge of stream in evergreen jungle, 195 m., *Kerr* 2398.
Distr. Upper Burma: Myitkyna, *Lace* 5161.
Lao name, Cha hawm (ex *Kerr*).

Hemigraphis hispidula, *Craib* [Acanthaceae-Ruellieae]; facie *H. hirtae*, T. And., similis sed ramulorum pilis rigidioribus, foliis majoribus longius petiolatis pagina superiore pilis paucioribus aequabilibus instructis distinguenda.

Ramuli nodis inferioribus radicantes, pilis albidis rigidis divaricatis hispiduli; innovationes pilis niveis dense tectae. *Folia* opposita plus minusve inaequalia, ovato-lanceolata, ovata vel subrotundata, apice obtusiuscula, basi cuneata, late cuneata vel rotundata, 2·5–6 cm. longa, 1·8–3·3 cm. lata, rigide chartacea, pagina utraque pilis albidis longiusculis rigidis parce instructa, nervis lateralibus utrinque 6 pagina utraque prominulis, nervis transversis infra conspicuis, margine crenata vel crenato-serrata, nunquam serrata, petiolo ad 2 cm. longo hispidulo suffulta. *Sepala* 5, lineari-lanceolata, acuta, 5 mm. longa, 0·75 mm. lata, superne pilis albidis rigidis longiusculis divaricatis instructa, inferne ciliata. *Corollae* tubus 9 mm. longus, 2 mm. e basi ampliatus; lobi 5, inter se subaequales, oblongi, apice rotundati, ad 2·5 mm. longi et 2 mm. lati. *Filamenta* glabra, longiora circiter 2 mm. longa, minora duplo superantia. *Ovarium* 1·5 mm. altum, superne puberulum, 8-ovulatum; stylus apice incrassatus, 7·5 mm. longus, puberulus.

Between Prê and Nan, Hui Mê Sākawn, in evergreen jungle, covering the ground in places, 420 m., *Kerr* 2383; Nan, common in mixed jungle, 195 m., *Kerr* 2383a.

Aristolochia siamensis, *Craib* [Aristolochiaceae]; foliis tenuibus late cordatis distincta.

Caules scandentes, ad 4 mm. diametro, pallide brunnei, pluri-sulcati. *Folia* late cordata, apice acuta, sinu basali ad 3 cm. alto et 2·7 cm. lato, circiter 16 cm. longa et lata, chartacea, pagina superiore glabra, inferiore costa nervisque brevissime adpresse pubescentia praetereaque hic illic setulis albis sparsissime instructa, e basi trinervia, nervis inferioribus cito furcatis supra conspicuis subtus prominentibus, nervis transversis supra conspicuis subtus prominulis, petiolo circiter 5 cm. longo sulcato pilis brevibus adpressis albidis plus minusve deciduis instructo suffulta. *Inflorescentia* axillaris, multiflora, petiolos subaequans, ad 11 cm. diametro; bracteae parvae; pedicelli circiter 0·8–1·3 cm. longi, ut pedunculi bracteaeque pilis brevibus albidis adpressis instructi. *Receptaculum* 1 cm. altum, 1 mm. diametro, sulcatum, ut pedicelli pubescens. *Calycis* brunnei (ex *Kerr*) pars ima basi tubulosa vix 4 mm. longa; utriculus ovoideus vel globoso-ovoideus, ad 6 mm. altus et 5 mm. diametro; tubus superne dilatatus 1·8–2 cm. longus, medio 1–1·25 mm. diametro, pilis ut utriculus pedicellique instructus; limbus oblongus, apice breviter acuminatus, inferne attenuatus, 2 cm. longus, 1 cm. latus. *Corona* 6-lobata.

Mê Ping Rapids, Fa Man, 180 m., *Kerr* 2195.

Phoebe Kerrii, *Gamble* [Lauraceae-Cinnamomeae]; *P. declinatae*, Nees, affinis, ramulis et foliis siccis et paniculis pallidis glabris, floribus majoribus, foliis summo apice obtusioribus differt.

Arbor parva ; ramuli mediocriter crassi, cortice albescente lucido. *Folia* oblanceolata, apice obtuse acuta, basi attenuata, 9–13 cm. longa, 2·5–5 cm. lata, chartacea, glabra, supra lucida, infra pallida, costa pagina utraque conspicua siccitate flavescente, nervis lateralibus utrinque 9–10 ad marginem curvatis et ibi gradatim arcuatis ; reticulatio conspicue areolata ; petiolus 1·5 cm. longus, flavescens, supra canaliculatus. *Flores* virescentes, in paniculas pauciflоras glabras e foliorum ultimorum axillis ortas 6-7 cm. longas dispositi ; pedunculi 2–4 cm. longi, ramis brevibus et cymulis terminalibus 2–3-floris ; pedicelli circa 5 mm. longi. *Perianthii* tubus brevis ; lobi ovati, obtusi, 3 exteriores 3 mm. longi, interiores 4 mm. longi, intus sericei. *Stamina* inclusa, glabra, ordinum I. et II. 3·5 mm. longa, antheris oblongis et thecis ellipticis, ordinis III. 3·5 mm. longa, angustiora, thecis oblongis et glandulis 2 globosis glabris ad filamentorum basim positis ; ordinis IV. staminodia hastata, vix 2 mm. longa, glabra. *Ovarium* globosum, glabrum, stylo gracili, stigmate parvo subrecurvo. *Drupa* non visa.

Chiengrai, in deciduous forest on the edge of a marsh, 360 m., *Kerr* 2502.

352 **Litsea Garrettii**, *Gamble* [Lauraceae-Litseae] ; *L. amarae*, Blume, affinis, foliis oblanceolatis acuminatis subtus tomentosis, racemis pauciflоris antheris acutis et glandulis minimis stipitatis, perianthii tubo fructifero cupuliformi lobis deciduis differt.

Arbor 4–5 m. alta ; ramuli graciles, nigrescentes, ultimi pallide puberuli. *Folia* alterna, elliptica vel elliptico-oblanceolata, apice cuspidato-acuminata, basi acuta, 8–16 cm. longa, 3·5–6 cm. lata, chartacea, supra olivacea, nitida, subtus ferrugineo-tomentosa, tandem glabrescentia, viridia, costa gracili supra impressa, nervis lateralibus utrinque 6–8 curvatis prope marginem arcuatim junctis, nervulis transversis conspicuis ramosis, reticulatione conspicue areolata ; petiolus 1–1·5 cm. longus. *Flores* in umbellulis circa 4-floris in racemos axillares 1·5 cm. longos dispositis ; pedunculi graciles, 8 mm. longi, puberuli ; bracteae involucrales 4, ovatae, concavae, reflexae, 5 mm. longae, extra pallide puberulae ; pedicelli vix ulli. *Perianthii* tubus in flore ♂ brevissimus, in flore ♀ infundibularis, 2 mm. longus ; lobi 6, oblongi, obtusi, extra sericei, in ♂ 5 mm., in ♀ 2–3 mm. longi. *Stamina* floris masculi 9, ordinum I. et II. 6 mm. longa, filamentis gracilibus hirsutis et antheris anguste ovatis apice acutis, ordinis III. 5 mm. longa, filamentis hirsutis, antheris ovatis acutis, glandulis 2 minimis reniformibus stipitatis ad basem filamentorum. *Ovarii* rudimentum deficiens. *Staminodia* floris feminei 9–12, ordinum I. et II. clavata, 1·5 mm. longa, parce hirsuta, ordinum III. et IV. breviora, subulata, glandulis 2 parvis stipitatis prope basem instructa. *Ovarium* ovoideum, glabrum, stylo crasso curvato, stigmate peltato. *Drupa* oblonga, 1–1·5 cm. longa, 5–6 mm. diametro, pericarpio laevi nigrescente, in perianthii tubo incrassato cupuliformi ore 6 mm. diametro insidens ; pedicellus incrassatus, 8 mm. longus.—*Litsea* sp., Craib in Kew Bull. 1911, p. 452, et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 177.

Doi Intanon, *Garrett* 63 (♂), Chiengmai, Doi Sootep, 900–1650 m., in evergreen forest, *Kerr* 880, 2541, 2602 (♀).

XXXIV.—A NEW GRASS PARASITE.

(*Cladochytrium graminis*, Büsgen.)

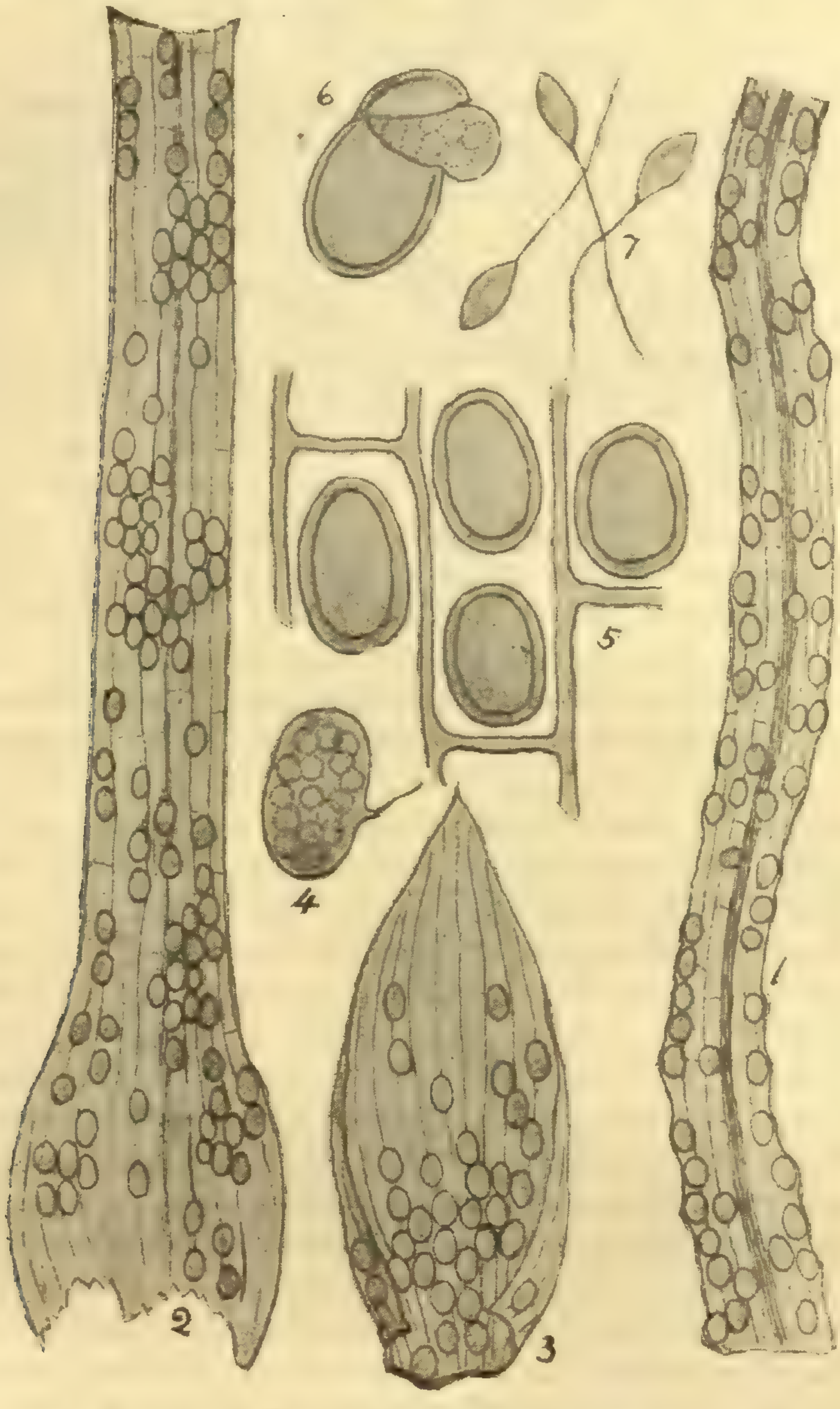
G. Massee.

The parasite was first observed in this country in 1908, when a sod of diseased grass was sent to Kew for determination. In connection with this it was stated that the disease had appeared in every instance, where portions of a consignment of continental grass seed had been sown. The spread of the disease was checked by the removal and burning of all diseased patches, and nothing more has been heard of the parasite until the present season, when its presence has been notified at Kew from several widely separated localities in the south of England. At present the parasite has only been observed to attack species of *Festuca* and other grasses with small leaves, and is consequently most prevalent on lawns, tennis grounds, bowling-greens, &c. The symptoms of its presence are the appearance of small yellowish patches a few inches across scattered over the lawn. These patches gradually increase in size and often encroach on each other, forming large irregularly shaped areas which eventually become brown owing to the entire disappearance of the grass.

The fungus under consideration, like the one causing "damping off" in seedlings, belongs to a primitive type, in which the reproductive bodies called zoospores possess the power of spontaneous movement in a film of water, by which means they are enabled to migrate from their place of origin, and infest adjacent plants. This peculiarity explains the observation made by a correspondent, that the disease spreads most rapidly after a fall of rain. The root of the grass is the part first attacked. As the result of infection a very slender, branching mycelium spreads in the tissues, which gives origin to numerous thin-walled zoosporangia, from which zoospores are liberated. These in turn infect the roots of neighbouring plants, thus a single infected plant, acting as a centre of disease, may lead to the destruction of the grass extending over a large area when weather conditions favour the dispersion of the zoospores. At a later stage myriads of thick-walled resting-spores are formed in the tissues of the root and of the lower leaves that are lying on the ground. In rare instances resting-spores are also present in the flowering glumes and in the "seed" coat. This probably only happens when the inflorescence has by some means been pressed close to the ground, where the zoospores would be able to reach it. Where infected plants die the resting-spores are set free in the soil, which is invariably infected after the growth of a diseased crop. The resting-spores remain in the ground for some time in an unchanged condition, and on germination liberate zoospores, which are capable of attacking the roots of grass and causing a new outbreak of the disease.

Seed of *Poa annua* and of *Festuca ovina*, sown in soil infected by mixing with it a broken up sod of diseased grass produced diseased plants, whereas *Dactylis glomerata*, and *Triticum caninum*, sown in infected soil, remained free from disease. Control sowings of the four grasses in uninfected soil remained healthy.

Microscopic examination of a sample of grass seed that had produced a diseased crop, showed that only about five per cent of the seed contained resting-spores of the fungus in the seed coat.



1. Resting-spores in fragment of grass root × 65.
2. Resting-spores in fragment of grass leaf × 65.
3. Resting-spores in flowering glume × 65.
4. Zoosporangium containing zoospores × 400.
5. Resting-spores in cells of leaf × 400.
6. Resting-spore commencing to germinate × 400.
7. Free zoospores × 600.

This percentage, however, is more than sufficient to set up diseased patches at intervals in the seed-bed or lawn. These would serve as starting points from which the parasite could spread in every direction, more especially during a rainy season.

A plot of *Poa annua*, grown in infected soil, showed the presence of the disease in a few scattered plants when seven weeks old. It was found that by watering the soil with a solution of sulphate of iron—half a pound to a gallon of water—the spread of the disease was checked.

A second plot of *Poa annua*, grown in infected soil, but not treated, was killed by the parasite.

The treatment should follow a rainfall, or a thorough soaking of the ground with water, for the reason already given. It is important that the treatment should be repeated two or three times, according to circumstances, at intervals of about ten days as free zoospores only are killed, and these are liberated at intervals.

It is very doubtful as to whether any known method of seed sterilisation would prove of value, as the thick-walled resting-spores are imbedded in the tissues of the seed, whereas the spores of "smut," "bunt," &c, where proper treatment proves effective, are not so thick-walled, and lie free on the surface of the seed.

Now that the disease is undoubtedly present, and perhaps to a greater extent than is realised, the most certain method for preventing its wholesale distribution turns on the selection of seed from districts free from the disease, and as the symptoms are so evident in the field and so readily corroborated, or otherwise, in the laboratory, this should prove a comparatively easy matter.

This parasite has probably been introduced from the Continent. It is not known as an indigenous British fungus, and was first found by De Bary in Germany.

XXXV.—CEDAR WOODS.

W. Dallimore.

The frequency with which the word cedar is used in connection with various kinds of timbers suggested the compilation of a list of the trees to which the name is applied, and in the following notes attention is directed to the various species and their uses. Except in those instances where the wood is generally known as cedar, references are given to works in which the name is used, and in each case the information has been extracted as far as possible from the books where the names occur.

There appears to be little doubt that the name was originally used in connection with the cedar of Lebanon, and that, by reason of its association with Biblical history, is the most widely known cedar of the present day although its wood is one of the least important of the many which now bear the name of cedar. The chief reason for the adoption of the name for many kinds of woods appears to be that they possess an odour very like that of the cedar of Lebanon, but in other cases a real or fancied resemblance between the leaves or the bark of two trees has been found a sufficient reason for the name. Then again the name appears to have been given to some woods in order to try and create a market for the timber, whilst in other instances there does not appear to be any good explanation for the use of the word. From these several reasons, the name of cedar has been brought into use for trees and woods which are totally distinct in habit and structure, belonging to widely different families and coming from many different parts of the world. In the following notes the various trees to which the name of cedar is applied are arranged in their respective Natural Orders.

Meliaceae.

Dysoxylum Fraseranum, *Benth.*—Pencil Cedar, Rosewood, Mocondie.

According to Stone, "Timbers of Commerce," p. 40, the name of pencil cedar is applied to the wood of this tree, although Maiden refrains from its use and contents himself by saying that it is somewhat like red cedar. Both Maiden and C. Moore, the latter in the "Catalogue of Woods from the Northern District of New South Wales, sent to the London Exhibition of 1862," refer to it as rosewood and mocondie. Moore gives the scientific name as *Synoum glandulosum*; but Maiden, "Forest Flora of New South Wales," iii, pt. xxiii, No. 83, indicates that the name was given in mistake for that of *Dysoxylum Fraseranum.*

The tree is found in the richer or "cedar brush" forest regions of New South Wales and also in southern Queensland, where, under suitable conditions, it attains a height of 80 to 140 feet and a girth of 15 to 20 feet, although trees have been measured with a girth of 40 feet. Of twelve trees measured in one district, the average girth is given as 16 feet. The wood is described as moderately hard, straight-grained, easy to work, taking a good polish and weighing 41 to 44 lbs. a cubic foot when dry. Stone gives the weight as about 56¼ lbs. a cubic foot, but he does not say that the wood was seasoned. It is used for furniture, cabinet work, shop fittings, panelling for houses and steam boats and for other purposes. Specimens in the Kew Museums show reddish heart-wood and yellowish sapwood, but the colour fades with long exposure to light.

When freshly cut the wood has a rose-like scent from which the common names of rosewood and cedar have originated. Maiden refers to the wood having an oily character, which is considered a disadvantage as it prevents its taking glue well. As the result of an enquiry made by the Minister for Lands, New South Wales, the stock would appear to be very considerable, for one district alone is said to be capable of supplying 15,000,000 feet. A description of the tree as growing in Queensland is to be found in the "Catalogue of Queensland Woods, exhibited at the Colonial and Indian Exhibition, London, 1886," by F. Manson Bailey.

Dysoxylum spectabile, *Hook.*—Cedar.

This tree is described as cedar by Mr. and Mrs. E. H. Featon in "The Art Album of the New Zealand Flora," (1889). The native name of "kohekohe," is also given and the tree is described as being most common in the Northern Island, occurring rarely in the northern part of the Middle Island. At its best it attains a height of 50 feet with a diameter of 3 feet. The handsome, pinnate leaves peculiar to the genus, are present in this species and the small white flowers are produced in large panicles. These are followed by greenish fruits, which open when ripe and disclose the seeds covered with an orange or reddish aril. The wood is reddish in colour, close-grained, and used for furniture and fencing, but its durability is questioned. Wood, bark, flowers and leaves are credited with stomachic properties. *D. spectabile* is described

by Stone, "Timbers of Commerce," p. 42, where the common name of redheart is given. A further description of the species occurs in "A Manual of the New Zealand Flora," pp. 95–96, by T. F. Cheeseman.

Dysoxylum Muelleri, *Benth.*—Cedar, Pencil Cedar, Bastard Cedar, Red Bean.

This tree grows in the rich forest region of northern New South Wales and S. Queensland, and is met with between 50 and 70 feet in height with a trunk 3 feet or more in diameter. The pinnate leaves are up to 2 feet long and composed of an indefinite number of ovate or lanceolate leaflets 3 to 6 inches in length. The heart-wood is red in colour, nicely marked but odourless, the name of cedar having been given on account of a fancied resemblance between the grain of the wood and that of the American cedar or juniper.which is used for pencils. Moore refers to the wood under the name of *Synoum Lardneri* in the 1862 Exhibition Catalogue (see "Indigenous Woods of New South Wales, Northern District," p. 52, No. 51), and gives the common name of "turnip wood." With reference to this he says that the bark smells somewhat like a Swedish turnip. He describes the wood as being useful for housework and general purposes. Recent descriptions place it with good furniture woods. Good accounts of the tree and its wood are given by J. H. Maiden in his "Forest Flora of New South Wales," iii, pt. xxvii, No. 97, and by F. Manson Bailey in the "Catalogue of Queensland Woods" previously referred to, p. 11, No. 61a.

Dysoxylum rufum, *Benth.*—Bastard Pencil Cedar.

These names are coupled by Maiden, "Forest Flora of New South Wales," iii, pt. xxiv, No. 86, pp. 63–64. The tree is described as a large one growing 80 to 100 feet high with a girth of from 6 to 10 feet. It resembles other species in its large, handsome, pinnate leaves, but differs by having the under sides of the leaves, inflorescences, fruit and young shoots covered with a dense brownish tomentum, and by the flowers, fruits and wood when fresh being attended by a disagreeable onion-like smell. The sapwood is said to be white and the heart-wood red or reddish brown. The latter is nicely marked and is used for cabinet making and other purposes. According to Bailey's "Synopsis of the Queensland Flora," this species is found in Queensland forests as well as in those of New South Wales.

Dysoxylum malabaricum, *Bedd.*—White Cedar.

Reference is made to this tree by Gamble in "A Manual of Indian Timbers," p. 148. He described it as a very large tree with light, close-grained, hard, elastic wood, which is sweet-scented, and used for oil-casks. The tree is said to inhabit the forests of the Western Ghâts, Coorge, Malabar, the Anamalai Hills and Travancore at elevations of 1000–3000 feet. A suggestion is also made that the name of white cedar may sometimes be applied to a species of *Chisocheton*.

Cedrela Toona, *Roxb.*—Cedar, Red Cedar, Moulmein Cedar.

This tree is widely distributed in India, Burma, Queensland and New South Wales, but in Australia the synonymous name of

C. australis is often used. It is one of the most important of the Old World cedars and is considered to be one of the most valuable woods of New South Wales. The tree varies greatly in size, but is often found from 90 to 120 feet high with a diameter of 4 to 6 feet. It sometimes, however, exceeds 200 feet in height with a diameter of 10 feet. Maiden, "Forest Flora of New South Wales," i, pt. iii, No. 9, pp. 55–63, refers to one which is calculated to yield 30,000 feet of saleable timber when cut down, and to another which yielded 80,000 feet. The latter tree was cut off at 10 feet from the ground and measured 60 feet to the first branch.

The heart-wood is reddish in colour, prettily marked, especially in some cuts, is easily worked, carves well, and is employed for all kinds of furniture and cabinet work, panelling, &c., whilst it is considered to be one of the best of the Australian woods for carriage building and fittings for expensive houses. In India it is said to be very popular for tea boxes and cigar boxes in addition to the above-mentioned purposes. Several specimens, plain and polished, are to be seen in Museums I and III, at Kew. Polished wood bears a resemblance to mahogany, and the choicest furniture wood is said to be that from the junction of branches and trunk, for in such places it is very prettily curled. As a rule such sections are cut into veneer. An account of the tree as found in India is given in "Gamble's Manual of Indian Timbers," pp. 157–159.

Cedrela odorata, *L.*—Havannah Cedar, Barbados Bastard Cedar, Cuba Cedar, Honduras Cedar, Mexican Cedar, Jamaica Cedar, West Indian Cedar, Cedar.

The commercial importance of the wood of this S. American and West Indian tree has resulted in the numerous common names by which the timber is known. As in the case of the Australian and Indian *C. Toona*, *C. odorata* grows to a large size, and logs nearly 30 feet in length squaring up to 2 feet are imported into this country. The reddish-brown wood, although softer, is of almost as much importance for the manufacture of furniture, and for house and shop fittings, as true mahogany, while it is used very extensively in the manufacture of cigar boxes. Descriptions of the wood are given by Stone in "Timbers of Commerce," p. 36, and by Batterden in "Timber," p. 150.

Cedrela fissilis, *Vill.*—Cedro.

A specimen of the wood of this tree was received at Kew some years ago from Mr. G. Paddison. The section was brought from Paraguay, and the donor reported that it was obtained from a lofty tree, and that the wood was used for planks in ship-building, frames, carvings, canoes, and for every description of furniture. It is said to have a disagreeable, garlic-like smell when fresh, but nothing can be detected from the Kew specimen.

Owenia cepiodora, *F. Muell.*—Bastard Cedar, Bog Onion, Onion Wood.

Maiden says, "Forest Flora of New South Wales," iv, pt. xxxi, pp. 1–3, that the timber of this tree is a useful wood of the cedar class and that it is often sold as bastard cedar. It forms a tree up to 100 feet in height, with a diameter of 18 inches. Like many other trees in Meliaceae it bears handsome pinnate leaves and large

panicles of small flowers. The most familiar names of the tree are bog onion and onion wood, names which have arisen on account of the onion-like odour which is noticeable in newly-cut wood. The odour is said to disappear quickly, however, and to be no detriment to the value of the timber, which is used for cabinetwork, furniture, &c. Maiden records a curious character of the wood. This is, that although the wood when newly cut has usually a disagreeable smell, it is sometimes quite fragrant and suggestive of that of ripe water melons. A specimen of the wood in Museum No. I at Kew, shows it to be prettily marked with a satiny lustre.

Melia Azedarach, *L.* and **M. Azedarach**, *L.* var. **australasica**, *C. DC.*—Bastard Cedar, White Cedar, Bead Tree.

For all practical purposes these two trees may be considered together, for as Maiden indicates in his description of the latter tree, "Forest Flora of New South Wales," iii, pt. xxv, No. 92, p. 93, they are practically identical. *M. Azedarach* is a familiar decorative greenhouse plant in this country, being often grown under the name of Persian lilac. In Australia, India and other countries, it forms a tree up to 60 feet in height with a trunk 2 feet or so in diameter. Its compound leaves, which are large and ornamental, are made up of a considerable number of lance-shaped leaflets which vary in size, but are often $1\frac{1}{2}$ or 2 inches long. The flowers are fragrant, whitish heavily shaded with lilac, or lilac throughout, and are borne in large panicles from near the ends of the branches. They are followed by yellow, berry-like fruits containing small hard seeds which are sometimes threaded and used for beads (see specimens in Museum No. I, at Kew). The fruits appear to be highly poisonous to human beings and animals although some birds are said to feed on them without inconvenience. Maiden, l.c. pp. 95–96, has collected a good deal of evidence relating to the poisonous nature of the fruit, and amongst other animals, pigs appear to be very susceptible to the effects of the poison. The juice of the bark and leaves has been collected by the Queensland natives and used for poisoning fish. Moore described the timber for the 1862 Exhibition Catalogue as being soft, easily worked, and principally used for shingles which are of an inferior kind. Subsequent descriptions from Australian sources are not in a more favourable vein, but Gamble, "A Manual of Indian Timbers," speaks rather more encouragingly about it. A specimen of white cedar in Museum No. III, at Kew, is named *M. composita*, Willd., and *M. composita* is also referred to as white cedar in "Bailey's Synopsis of the Queensland Flora," p. 60, and in his "Catalogue of Queensland Woods exhibited at the Colonial and Indian Exhibition, London, 1886." As Maiden, however, indicates, *M. composita*, Willd., is now considered as a synonym of *M. Azedarach*.

Flindersia australis, *R.Br.*—Red Cedar.

This species is described by F. M. Bailey in his 1886 "Catalogue of Queensland Woods," and is sometimes called Crow's Ash. Forming a medium-sized tree, it is described as having pinnate leaves made up of from 3 to 6 oblong leaflets, and producing white flowers in rather dense clusters. The wood is yellow, close-grained, very hard, and of great strength and durability.

Chickrassia tubularis, *Ad. Juss.*—Cedar, Bastard Cedar.

In "Balfour's Timber Trees," 3rd ed., (1870), p. 71, the wood of this tree is recorded as cedar, bastard cedar and deodar, probably on account of its wood having a scent somewhat like that of *Cedrus Deodara*. It forms a large tree, considerably over 100 feet high, with a long straight trunk and large handsome leaves. The wood is hard, brownish in colour, works with a fine smooth surface, and is said to be used largely in India for furniture and carving. Its distribution is given as the forests of the Sikkim Himalaya; Assam, Eastern Bengal, and Chittagong, throughout S. India, Ceylon, Burma, and the Andaman and Cocos Islands.

Guarea, Trichilia and **Pseudocedrela** are three genera belonging to Meliaceae which, according to Mr. H. N. Thompson, "Gold Coast Report on Forests," 1910, furnish the timber which is known as West African cedar. The particular species are not dealt with.

Leguminosae.

Acacia elata, *A. Cunn.*—Cedar, Cedar Wattle, White Cedar Wattle.

The several common names by which this tree is known, are said to have been applied many years ago on account of its leaves bearing some resemblance to those of the better known Australian cedar trees, rather than from any similarity between the woods. In the "Forest Flora of New South Wales," iii, pt. xxii, No. 82, pp. 23–25, Maiden describes it as a handsome tree 60 feet or more high with pinnate leaves and inflorescences six inches long of globular flower heads. The timber is light coloured and of little merit. Maiden refers to the bark as being fairly rich in tannin. The species is said to be confined to New South Wales.

Albizzia Toona, *Bail.*—Acacia Cedar, Mackay Cedar.

This tree is described by F. M. Bailey in the Supplement to his "Synopsis of the Queensland Flora", and is also mentioned on p. 30 of his 1886, "Catalogue of Queensland Woods." He describes it in the latter place as a large tree with a dense head of dark foliage and rusty shoots. The leaves are feathery and made up of numerous small, more or less downy leaflets. The wood is described as of a light brown colour for several inches in from the bark, the rest resembling red cedar, It is considered to be a valuable wood for furniture and other work.

Anacardiaceae.

Rhodosphaera rhodanthema, *Engl.*—Yellow Cedar, Bill-boy Cedar, Light Yellow-wood, Deep or Dark Yellow-wood.

F. Manson Bailey in his "Synopsis of the Queensland Flora," p. 83, and in his 1886 "Catalogue of Queensland Woods," uses Mueller's name of *Rhus rhodanthema* for this tree with the common names of yellow-wood; but Maiden, "Forest Flora of New South Wales," i, pt. viii, No. 30, p. 181, and ii, pt. xx, p. 199, refers to it under the other common names quoted above. The species is

mentioned as a tree 50 to 60 feet high, bearing pinnate leaves, made up of 7 to 9 leaflets, each of which is from 2 to 3 inches long. The red flowers are borne in dense bunches and are followed by brown and glossy globose fruits. The timber is not represented at Kew, but it is described as rich dark yellow or bronze in colour, prettily grained and highly prized for cabinet work, railway carriage fittings, turnery and picture frames.

Araliaceae.

Panax elegans, *C. Moore* and *F. Muell,* and **P. Murrayi,** *F. Muell.*—Pencil Cedar, Black Pencil Cedar.

Maiden refers to both these trees as cedars in the "Forest Flora of New South Wales," i, pt. vi, No. 23, pp. 138–143, but Bailey in his "Catalogue of Queensland Woods" uses the alternative name of "mowbulan whitewood", and does not connect them with the cedars. In the latter work *P. elegans* is described as a tall and sometimes large tree with very large, wide-spreading leaves, much divided into ovate leaflets. It is found in all the coast scrubs of Queensland, also in New South Wales. The wood is soft, light, elastic and has been suggested as a substitute for willow for cricket bats in addition to being used for lining boards. It has also been recommended as a likely wood for musical instrument makers. *P. Murrayi* is described as a handsome tree with large leaves. The wood is light in colour and weight and has been suggested as likely to form good lining boards. A sample of the wood of the latter tree is to be seen in Museum No. I, at Kew, but it does not give one the impression as being either distinct or good enough to import into European countries.

Celastraceae.

Elaeodendron australe, *Vent.*—White Cedar, Blue Ash.

A description of this tree is to be found in Bailey's, 1886, "Catalogue of Queensland Woods," but the common names are not mentioned there. They occur in Maiden's "Useful Native Plants of Australia," p. 423. The tree is described as from 24 to 30 feet high with a trunk 4 to 12 inches in diameter. The wood is pinkish in colour, close-grained, tough, useful for staves, oars, shingles and tool handles. Bailey says that it warps a good deal in drying if cut before it is seasoned.

Boraginaceae.

Ehretia acuminata, *R. Br.*—Brown Cedar.

Mention is made of this tree in Bailey's, 1886, "Catalogue of Queensland Woods," p. 60. It is described as a small tree inhabiting creek sides in South Queensland, New South Wales and Victoria. In "Useful Native Plants of Australia," p. 421, Maiden says that it grows 20 to 30 feet high, furnishing a light brown, coarse-grained wood which is easy to work and closely resembles English elm.

Euphorbiaceae.

Phyllanthus Ferdinandi, *F. Muell.*—Pencil Cedar.

The name of pencil cedar is applied to the wood of this tree in "Useful Native Plants of Australia," p. 586. It forms a tree up to 70 or 80 feet high with a trunk 12 to 18 inches in diameter, and Bailey, in his "Catalogue of Queensland Woods" (1886), p. 73, describes it as follows. "A moderate-sized tree, with lively green foliage, the branchlets often reddish. Leaves oval-oblong, usually 3 or 4 inches long, but at times much longer. Flowers in the axils, or some distance up the stem towards the next leaf, very irregular, even on the same tree, in this respect. Along creek sides throughout Queensland; also in N. Australia and New South Wales. Wood easy to work, close in the grain, and of a grey colour; warps in drying."

Rutaceae.

Pentaceras australis, *Hook. f.*,—Scrub White Cedar.

This tree is referred to in Maiden's "Useful Native Plants of Australia," p. 584. The timber is described as close-grained, tough and firm, and the tree is said to attain a height of from 40 to 60 feet with a trunk diameter of 12 to 24 inches.

Rubiaceae.

Hymenodyction excelsum, *Wall.*—Cedar Wood.

This tree is referred to in "Balfour's Timber Trees," 3rd ed., (1870), p. 137, as cedar wood, but neither Gamble nor Brandis recognise the name. It is described by Gamble as a large deciduous tree native of the Sub-Himalaya, and lower Himalaya from the Ravi eastwards, ascending to 5000 feet; Central, Western and Southern India; dry forests in Burma. The wood is white or brownish and is used for packing cases and other minor purposes.

Urticaceae.

Ulmus americana, *L.*—Michigan Cedar, White Elm.

A recent reference to the wood of the white elm being called Michigan cedar was noted in the "Timber News" for February 13th, 1913, p. 4. It is there stated that one of its latest reported uses is the manufacture of cigar boxes, for which purpose it is stained red. Cigar boxes made from this wood are to be seen in Museum No. I, at Kew, where they have been on view for several years. *Ulmus americana* is widely distributed in North America where it forms a tree up to 100 feet in height with a diameter up to 7 or 8 feet. It thrives best on rich, moist ground and is useful for all the purposes for which the European Elms are employed.

The wood is heavy, strong and coarse-grained, light brown in colour with yellowish sapwood, Amongst other uses it is employed for hubs of wheels, boat building, coffin boards, and flooring. It does not possess the fragrance which is usually associated with cedar woods, but in its use for cigar boxes fragrance is introduced with the staining matter.

Ulmus crassifolia, *Nutt.*—Cedar Elm.

This species is referred to as cedar elm in several American publications. It is found in Arkansas, Texas, Mexico and other places as a small tree 30 to 40 feet high with a trunk 2 to 3 feet in diameter. The wood is described as reddish-brown, rather weak and used locally for furniture and hubs.

Saxifragaceae.

Cunonia capensis, *L.*—Red Cedar, Cape Red Cedar, Red Alder, Red Els.

This South African tree is described by **Stone** in "The Timbers of Commerce," pp. 109–110, as red cedar, but **Sim,** in "The Forests and Forest Flora of Cape Colony," p. 217, uses the apparently more familiar Cape names of red alder and red els. Sim describes the species as a small evergreen tree growing up to 50 feet high with a short bole sometimes 3 to 4 feet in diameter. It appears to attain its largest proportions in Kaffraria, where it is found at altitudes varying from 2000 to 5000 feet, rarely within 40 miles of the sea. In Pondoland, where it approaches within a few miles of the sea, it is said to occur as a stunted specimen. It occupies open country rather than dense forest and is reputed to be a good fire resister. The wood is red in colour and has been compared to boxwood in hardness; it takes a good polish and is suitable for furniture, spokes and turnery. The South African Forest Department encourages the planting of this tree.

Sterculiaceae.

Guazuma tomentosa, *H.B.K.*—Bastard Cedar.

In the Index to the common names of plants described in "Griesbach's Flora of the British West Indies," this tree is referred to as bastard cedar. Usually met with from 15 to 20 feet in height, it occasionally attains a height of 50 feet. It is widely distributed in Tropical America and the West Indies and as an introduced tree in India, Java, &c. Gamble, in "A Manual of Indian Timbers," says that the wood is used for panels of coaches, furniture and packing cases.

Protium altissimum, *March.*—Red Cedar, White Cedar, Cedar.

This tree is a native of British and French Guiana, and Aublet in "Historie des Plantes de la Guiane Francois," i, pp. 342–343 describes it under the name of *Icica altissimum*, saying that it grows about 60 feet high with a trunk 3 to 4 feet in diameter. According to Batterden, "Timber," p. 129, the wood is obtainable in long lengths up to 2 feet square. It is reddish in colour and is used for cabinet making and other purposes. Aublet refers to it as red and white cedar, and Batterden says that the wood is reddish-brown but that there is a variety known as white cedar.

Surinaceae.

Suriana maritima, *L.*—Bay Cedar.

A description of this small tree may be found in Britton's "North American Trees," p. 589, where it is described as growing between

6 and 25 feet in height and as being of bush-like habit with reddish-brown, heavy wood which is not of sufficient bulk to find any use except that of firewood. It is found in Florida, the West Indies and in northern South America.

Bignoniaceae.

Tabebuia pentaphylla, *Hemsl.*—White Cedar.

In "Timbers of Commerce," p. 169, Stone combines these two names, or rather gives *T. pentaphylla* as the white cedar of Bermuda and the Windward Islands. It is also suggested to be the source of West Indian boxwood, although there is still some doubt as to exact identity of that wood. The wood is yellowish in colour, fine and close-grained.

Tecoma leucoxylon, *Mart.*—White Cedar.

The wood of this West Indian tree is sometimes used for furniture and other purposes. According to a reference in the "Report on General Administration Record of New Granada," (1911–1912), pp. 13–15, the species is attracting attention for forest planting and is also used for avenues.

Coniferae.

Torreya taxifolia, *Arnott.*—Stinking Cedar.

This is described in Sargent's "Silva of North America," x, pp. 57–58, under the name of *Tumion taxifolium*, Green. It is a small evergreen tree, sometimes attaining a height of 40 feet with a trunk up to 2 feet in diameter, found in a restricted area in western Florida. The common name originated on account of the wood resembling in appearance other woods which are known as cedars and by the leaves giving off a foetid odour when bruised. The heart-wood is described as being of a clear, bright yellowish colour with lighter sapwood. A specimen in Museum No. III, at Kew, however, has a brownish tinge. Although not in general use, Sargent says that it is hard, strong, rather brittle, has a satiny surface and polishes well. He adds that it is used locally for fence posts on account of its durability when in contact with the soil.

Torreya californica, *Torr.*—Stinking Cedar, Coast Nutmeg, California False Nutmeg.

In "North American Trees," Britton refers to this on p. 127 as stinking cedar, in addition to *T. taxifolia*. It forms a small tree 35 feet or so high with a trunk 2 to 3 feet in diameter. The wood is very like that of the other species and is used for similar purposes.

Libocedrus decurrens, *Torr.*—Red Cedar, White Cedar, Bastard Cedar, Post Cedar, Incense Cedar, Californian White Cedar, Western White Cedar.

Hough, in "American Woods," vi, No. 141, p. 44, records this tree as being a native of the coastal regions of Oregon and California ascending the mountains of S. California to an elevation of 8,500 feet. Under the most favourable conditions it attains a height of 100 to 150 feet with a diameter of 6 or 7 feet, its outline being stiff and columnar. This latter feature is very noticeable in ornamental specimens in this country. Hough describes the wood as very light, soft, brittle, close-grained, compact, odorous, durable in contact with

the soil and with dark-coloured bands of summer cells. The heart-wood is reddish-brown and the sapwood yellowish. It is used for the interior finish of houses, shingles, and fencing, whilst Jepson, "The Silva of California," pp. 148–149, refers to its use for telegraph and telephone poles.

Libocedrus Bidwillii, *Hook. f.*—New Zealand Cedar, Pahautea.

Two species of *Libocedrus* are indigenous to New Zealand, the one under notice and *L. Doniana*, Endl. Of the two *L. Bidwillii* only appears to be known as cedar, although the wood of both trees seems to be put to similar uses. T. F. Cheeseman describes both trees in his "Manual of the New Zealand Flora," pp. 646–647, and he says there that *L. Bidwillii* is the smaller tree, rarely growing more than 50 feet high with a trunk diameter of 1½ to 3 feet. It is found in both the North and South Islands at elevations varying from 800 to 4,000 feet. The wood is described as soft, red, straight in the grain, easily split and apparently of great durability but of low specific gravity and somewhat brittle. An example may be seen in Museum No. III, at Kew, which was obtained from the Melbourne International Exhibition of 1880.

Cupressus Lawsoniana, *A. Murr.*—Port Orford Cedar, Cedar, White Cedar, Oregon Cedar, Lawson Cypress, Matchwood.

Reference was made to this tree in *K.B.*, 1912, p. 78. It is a native of Oregon and northern California and under the most favourable conditions attains a height of 200 feet with a diameter of from 6 to 12 feet. The wood is light yellow in colour, fragrant, and is an esteemed and valuable wood for the interior finish of houses, boat-building, railway sleepers, fence posts and match making.

Cupressus nootkatensis, *Lamb.*—Yellow Cedar, Yellow Cypress.

This is another important wood from Western North America. It occurs from southern Alaska to Oregon, and sometimes attains a height of 100 feet with a diameter of 5 or 6 feet. The wood is light but moderately hard, close-grained, fragrant, and yellowish in colour. It is used for cabinet-making and for various other purposes. For further particulars see *K.B.*, 1912, p. 79.

Thuya plicata, *D. Don.*—Western White Cedar, Canadian Red Cedar, Red Cedar, Canoe Cedar, Yellow Cedar, North Western Red Cedar, Oregon Cedar.

Amongst Western North American Conifers this is an important one from a commercial standpoint, for not only is considerable use made of its wood in its native country, but it has proved itself amenable to cultivation in various foreign countries and is looked upon as a likely forest tree in different parts of Europe, including the British Isles. It is found in Alaska, British Columbia, Oregon, Washington and Northern California, where it is met with from a moderate-sized tree 50 to 70 feet high with a trunk 3 feet or so in diameter, to giant specimens 200 to 250 feet high with a trunk diameter of 18 feet. Jepson, in "The Silva of California," pp. 150–151, refers to it as a tree growing from 150 to 225 feet high with a trunk 16 or 18 feet in diameter near the ground. The head is usually narrow and the tree may be readily distinguished from *T. occidentalis* by its more vigorous habit and darker leaves. The

sapwood is yellowish in colour and the heart-wood reddish brown. Both are fragrant, easy to work, and light; the heart-wood in particular is very durable and stands exposure well. Its principal use is for shingle making, but it is also widely employed as a general building wood, particularly for doors and window frames, also for posts and rails, barrels and boxes.

Hough, "American Woods," ix, No. 220, p. 45, in referring to its durability and use for shingles, instances a case of a tree which had fallen in the forest and upon the trunk of which another tree showing 130 annual rings had grown, being generally sound, and after the removal of the second tree, the wood of the first was used for shingles. He says that in December, 1899, he was informed that in the State of Washington 158 shingle mills were operating and turning out thousands of car loads of shingles annually. The name of canoe cedar arose by reason of the N. American Indians hollowing the trunks out for canoes. The same tribes used the inner bark for weaving into cloth, baskets, blankets, &c.

Cupressus thyoides, *L.*—Cedar, Coast White Cedar, White Cedar.

Writing of this tree in the "Silva of North America," x, p. 91, Prof. Sargent refers to it as one of the most valuable timber trees of North America by reason of its growing in cold swamps where no other timber tree would flourish. Under the best conditions it is found as a tree 70 to 90 feet in height with a trunk 3 to 4 feet in diameter. The timber has a good reputation for durability. It is light coloured, fragrant, works easily, and is used for building purposes &c. Hough, "Elements of Forestry," p. 306, makes the following interesting observations about the wood. "Enormous quantities of this wood are found buried in salt marshes in Southern New Jersey where no timber now grows. In searching for it the marshes are probed with iron rods, and when a tree is found, its size, direction and quality are ascertained. By tearing off a piece of wood, it may be known by the odour, whether it fell from age, or was blown down by the winds. If the latter, it is more valuable, and after cutting away the turf at the top, the wood is sawn off in two places, when it will rise and float away bottom upwards because the lower side is soundest. The wood has all the buoyancy of fresh cedar, not being in the least water-logged and the bark is still fresh. Tree after tree from 200 to 1000 years old may be found lying across one another, some partly decayed as if they had stood a long period after they were dead. The wood is sawn into boards or made into shingles." He quotes from the Forestry Report of 1877 that from $9,000 to $10,000 worth of shingles have been made in a single year from this buried cedar in the vicinity of Dennisville. In the British Isles it is grown as an ornamental tree, and is distinguished by its small, scale-like leaves, small cones and fastigiate habit.

Cedrus Libani, *Loud.*—Cedar of Lebanon.

This, the cedar of the Syrian Mountains and particularly of Mount Lebanon, is by reason of its association with Holy Writ probably the oldest and most widely known cedar. It is probable that many cedars of the present day owe their common names more or less directly, to their wood having an odour somewhat similar to that of this tree. Vague ideas exist regarding the value

of the cedar of Lebanon, and owners of fallen trees in this country usually expect a high price for the timber, whereas it does not find even a low place in the timber market and is classed amongst the poorer kinds which are sold for firewood.

Mature specimens present a very imposing appearance for they may be from 60 to 90 feet high with a trunk girth of 9 to 16 feet, the heads being tabular in outline and composed of a number of massive branches. When grown amongst other trees a considerable length of clean trunk is formed but when grown in the open, branches usually occur fairly low down. Under ordinary conditions in the British Isles, trees attain their normal size at from 100 to 130 years of age, after which growth is very slow. The wood is yellowish-brown and has been recommended for building purposes; but that produced in this country is coarse and inferior to Scots pine. It is, however, popular for burning on account of its fragrance. The first plants are reported to have been introduced to this country about 1683, and a considerable number of the older trees which now exist are known to have been planted about the middle of the following century. An interesting account of this and other species of *Cedrus* may be found in Vol. iii, of the "Trees of Great Britain and Ireland," by Messrs. Elwes and Henry.

Cedrus atlantica, *Manetti*.—Atlas Cedar.

Botanists are disposed to regard this as a geographical form of *C. Libani* rather than a distinct species, for mature trees growing under natural conditions are said to produce no distinctive characters, although it is not difficult to separate young trees of the two kinds as they are seen growing in this country: the Atlas Cedar being of more rapid growth and the branches having a looser and more pendant habit than those of *C. Libani*. *C. atlantica* is found at an altitude of from 4000 to 7000 feet in the Atlas Mountains, where it forms the principal feature of the arborescent vegetation. It was introduced to English gardens about 70 years ago, is perfectly hardy, grows freely, forms a useful decorative tree, and has been suggested for forest planting; it remains to be seen, however, whether its timber will be of sufficient value to warrant its use in this country for the latter purpose. In northern Africa its wood is used for building purposes, posts, &c.

Cedrus Deodara, *Loud*.—Deodar, Indian Cedar, Himalayan Cedar.

This tree may be distinguished from both the Atlas and Lebanon cedars by its longer leaves and more leafy branches. It is a native of the Himalaya and is considered to be the most important timber tree of northern India, its wood being in demand for general building purposes, railway sleepers, posts, and other uses. It occurs at elevations varying from 4000 to 10,000 feet and under favourable conditions attains a large size. Trees have been recorded upwards of 200 feet in height with girths of from 30 to 35 feet, although average-sized trees are much smaller. The forests are replenished by natural regeneration and they are the object of much care on the part of the Indian Forest Department. Gamble, "A Manual of Indian Timbers," pp. 710–715, gives an interesting account of the tree under natural conditions, and from his description of the wood the following remarks have been extracted :—"Deodar wood is very

durable ; probably, with cypress, the most durable of the Himalayan woods. Stewart mentions the pillars of the Shah Hamaden mosque at Srinagar, in Kashmir, which date from 1426 A.D., and are now consequently (1901) 475 years old, as having been quite sound at the time he wrote. It resists wet, also white ants, and apparently does not suffer from dry rot."

Juniperus macropoda, *Boiss.*—Himalayan Pencil Cedar.

This species is widely distributed in the Himalaya from Nepal to Afghanistan, where it is found as a moderate-sized tree 40 to 50 feet high with a girth of 6 or 7 feet, although much larger trees have been recorded. As is the case with most other Junipers, it is of slow growth and often forms knotty wood. The timber is described as fragrant and moderately hard, and specimens in Museum No. III, at Kew, show it to have reddish heart-wood and yellowish sapwood. It is said to be used for wall-plates, beams and fuel, but neither Gamble nor Brandis says that it is used for pencil-making, although Gamble, "A Manual of Indian Timbers," p. 698, calls it the Himalayan pencil cedar.

Juniperus communis, *L.*—Ground Cedar, Common Juniper.

Sargent, in the "Silva of North America," x., p. 75, refers to the common juniper as the ground cedar, although it does not appear to be classed as a cedar in Europe. A common species throughout Europe and Northern Asia, it is a familar shrub in many parts of the British Isles. In some parts of the Highlands of Scotland it is the commonest shrub after the heather and ling, whereas in the chalky soil of Hertfordshire and Buckinghamshire it is a familiar bush on commons and sometimes in pasture fields. Its wood is of no value.

Juniperus tetragona, *Schlecht.*—Rock Cedar.

This tree is described by Sargent in the "Silva of North America," x, p. 91, under the name of *J. subinoides.* It is a native of Mexico and Texas and is said occasionally to attain a height of 40 feet, although its normal height is 20 feet and its diameter one foot. Except for various local uses, such as posts and rails, it does not appear to be of any commercial value.

Juniperus occidentalis, *Hook.*—Western Red Cedar, Yellow Cedar, Canadian Juniper, Californian Juniper.

The several common names here mentioned are referred to by Stone "Timbers of Commerce," p, 257. Sargent "Silva of North America," x, describes the tree as sometimes attaining a height of 40 or 50 feet with a trunk 3 feet in diameter, but it is usually much smaller and sometimes a mere bush a few feet high. It is fairly widely distributed in North Western America from Canada to California. The wood is heavy, close-grained and fragrant but less highly coloured than that of *J. virginiana.* It is said to be used for fencing as it stands exposure well and does not decay readily when in contact with the ground. Generally, it can only be compared with the inferior qualities of *J. virginiana.*

Juniperus mexicana, *Schiede.*—Rock Cedar, Juniper Cedar, Mountain Cedar, Cedar.

In "North American Trees," by Britton, p. 116, this species is described as rock cedar in addition to the other names here

given. A native of Texas and Mexico, it forms forests and dense brakes in the limestone hills ; its maximum height being 90 to 95 feet and its trunk diameter 9 to 18 inches. The wood is described as hard, weak, close-grained and brown. It is used for general construction, fencing, sills, telegraph poles, railroad ties and fuel.

Juniperus pachyphlaea, *Torr.*—Oak-barked Cedar, Thick-Barked Cedar, Mountain Cedar.

The above mentioned common names in addition to various others such as thick-barked juniper, alligator juniper and checkered-barked juniper are applied to this tree by Britton in "North American Trees," p. 113. It grows in the dry parts of Texas, New Mexico, and Arizona, where at its best it attains a height of about 50 feet. The wood is reported as weak, soft and brittle, light red, and close-grained.

Juniperus californica, *Carr.*—White Cedar, Sweet-berried Cedar, Californian Juniper.

This is a small tree or large bush native of California, Arizona, &c. At its best it approaches 40 feet in height with a trunk up to 12 inches or so in diameter. The wood is described as soft, close-grained and light reddish-brown. It is durable and used for fence posts in its native country. The common names quoted above are used by Britton, l.c. p. 109.

Juniperus barbadensis, *L.*—Barbados Cedar, Southern Red Cedar, Red Cedar.

Specimens of the wood of this tree in Museum No. III, at Kew, bear a close resemblance to the wood of *J. virginiana,* and it appears to be used with that wood by pencil makers. It is found in the Southern United States and the West Indies, where it attains a height of about 30 feet. Britton, l.c. p. 119, describes the wood as soft, weak, close-grained, red, fragrant and at one time used largely by pencil makers but now becoming uncommon.

Juniperus bermudiana, *L.*—Bermuda Cedar, Bermuda Red Cedar.

This is a moderate-sized tree native of Bermuda. According to "Garden and Forest," iv, pp. 289–290 it is the most important tree in the island and dominates the other arborescent vegetation. It appears to be able to adapt itself to a variety of conditions, for it occurs on brackish swamp lands and also on dry limestone hills. The larger trees are about 40 feet high with a trunk diameter of 3 to 4 feet. The wood is used for ship-building and the best marked samples for furniture. Cedar chests and cabinets made from the wood are said to be highly prized in Bermuda and to be handed down as heirlooms from generation to generation.

Juniperus virginiana, *L.*—Cedar, Pencil Cedar, Red Cedar, Virginian Cedar.

It would be difficult to overestimate the importance of this tree for no other wood has yet been found to equal it for the manufacture of casings for lead pencils. The species has a very wide distribution in North America, and according to Hough, "Elements of Forestry," p. 308, "it extends from about latitude 45° in Canada,

to the Gulf States, and from the Atlantic to the mountains that border the Pacific States. Between the Sierras and the Wahsatch Mountains it occurs at an elevation of from 5000 to 7000 feet above sea level, and is there a small tree, usually not over a dozen feet high and of low, compact form." Under the most favourable conditions however, it has been met with 120 feet high with a diameter of 3 feet (see "Forest Planting Leaflet," Circular 73, U.S. Dept. of Agriculture). Timber suitable for cutting is apparently becoming scarce in some localities and the comparative shortage of easily available timber has been alluded to several times of late in trade journals. A note occured in the "Timber News" for Feb. 1st. of the present year, p. 4, to the effect that the supply of wood suitable for pencil stock is so reduced that in Tennessee the pencil factories buy logs from old cedar barns, and fence rails, in some cases paying as high as 10 cents a rail, in addition to putting up a new wire fence. *Juniperus virginiana* grows in a great variety of soils but is said to thrive most satisfactorily in America in light, loamy soil containing lime. It grows quite well in this country, but probably develops too slowly to warrant its inclusion amongst forest trees. The wood is reddish and fragrant, and between the knots it is straight-grained. An experimental plantation has been made at Avondale, in Ireland.

Juniperus procera, *Hochst.*—East African Cedar.

Some notice has been taken of this tree of late as a likely substitute for the wood of *J. virginiana* for pencil making, and an account of the timber as received in Liverpool from Usambara, German East Africa, is to be found in *K.B.*, No. 2., 1913, p. 82. The wood is described as having a fine, straight and almost even grain, a beautiful dark-red colour, an even texture, a fragrant cedar-like odour, and as being brittle, non-resinous, of light weight and nearly as soft as red cedar.

Callitris arborea, *Schrad.* — Clanwilliam Cedar, Cedarboom. ***Widdringtonia juniperoides***, Endl.

T. R. Sim, in "The Forests and Forest Flora of Cape Colony," pp, 338–340, describes this tree as occurring singly or in small clumps over an area 30 miles in length in the Cedarberg Range; the lowest altitude at which the species occurs being given as about 3425 feet and the highest as 4800 feet, a region where the climate is characterised by being very hot and dry in summer and cold and wet in winter. It is only known to grow wild in the one district, and with reference to this Sim says "the curious distribution of this tree, confined as it is to one range of mountains far away from all other forest areas and related only to its few congeners in S. Africa, to another large tree in Central Africa, and to others in Madagascar, Australia, and New Caledonia, gives it a unique position in respect to its relation to other parts of the Cape Flora. These African species are evidently the last remains of a vegetation which it is only reasonable to believe included at some far remote period a more connected and much larger area than it does now." Fifty or sixty years ago the tree was more plentiful than at present and larger trees existed. The forests have, however, been depleted by lumber-men and by fires. Formerly trees were known

which measured 60 to 70 feet in height and 12 to 18 feet in girth; but the best trees of the present day are much smaller. The timber is very inflammable, yellowish in colour, easy to work, fragrant and useful for the general woodwork of houses, furniture, posts, &c. It is considered to be one of the best native woods of S. Africa and the species is being planted by the Forestry Department of the Union of S. Africa.

Athrotaxis selaginoides, *D. Don*.—Cedar of Tasmania, King William Pine.

A specimen of the wood of this tree which was obtained from the International Exhibition of 1862 is to be seen in Museum No. III. at Kew. The species is known in this country as a rare decorative bush, its culture being restricted to the milder parts of the country. A detailed description with numerous figures of the plant, including one of trees growing under natural conditions, may be seen in the "Pines of Australia," by R. T. Baker and H. G. Smith, pp. 303–312, its common name being given there as King William Pine. It is represented as a gaunt tree up to 100 feet high and 3 feet in diameter, common in the neighbourhood of Williamsford, Tasmania. The following particulars are extracted from the above-mentioned work. Under normal conditions the tree is a prominent feature amongst the scrub vegetation peculiar to the region in which it grows but is not a handsome tree, as it is of irregular outline with comparatively few branches which are usually confined to a small dense crown, the trunk often being bare for three quarters of its length. The wood is pale red when freshly cut but lightens on exposure. It is open and straight in grain, light in weight, easy to work and not unlike American redwood both in character and texture. It is in good repute for durability in Tasmania and is suitable for cabinet work, and coach building, whilst it is also said to make good oars and sculls. A peculiarity is mentioned regarding the leaves, for when they fall to the ground they remain green for upwards of 18 months.

Podocarpus elata, *R. Br.*—Pencil Cedar.

Maiden refers to this tree as pencil cedar in "Australian Native Plants," pp. 589–590. It is a native of New South Wales and Queensland and at its best attains a height of 100 feet with a trunk diameter of from 2 to 3 feet. The wood is described in the above mentioned work as being free from knots, soft, close, easily worked, good for joinery and cabinet work, and as sometimes affording beautifully-marked planks. Fine specimens are said to have a mottled appearance of surpassing beauty. It is further stated to be fine in grain, lasting and not readily attacked by white ants or teredo.

Pinus glabra, *Walt.*—Cedar Pine, Spruce Pine.

Britton, in "North American Trees," p. 43, gives this combination of names. The species is found in the South-eastern States from South Carolina to Florida and Louisiana, where it occurs as a tree up to 45 feet high with a trunk 3 feet in diameter. The wood is described as weak, soft, brittle, very close grained and of little value.

Pinus inops, *Soland.*—Cedar Pine, Jersey Pine.

This is referred to in the same work as the last-named species. Although often a small, scrubby tree, it sometimes grows 40 feet high with a trunk 2 to 3 feet in diameter. The wood is not of much value but is described as durable and used to some extent for pumps, water tubes and fuel. It is found in poor rocky soil from New York to Indiana.

Widdringtonia Whytei, *Rendle.*—Milanji Cedar.

An account of this coniferous tree, found by Mr. Whyte growing on Mount Milanji, British Central Africa, is to be found in *K.B.* 1892, pp. 122–123. It is the most prominent tree in the forests and specimens 140 feet high with trunks 5½ feet in diameter at 6 feet from the ground, with straight clean stems 90 feet long, have been recorded. Specimens of the wood in Museum No. III at Kew, are of a pale reddish colour and the wood appears to be of good quality and easily worked. It is, however, unknown commercially ; difficulties attending its extraction and transit preventing its becoming a commercial timber, although it is used locally for building purposes. It is also doubtful whether the tree exists in sufficient quantities to make its timber of any considerable importance even were it within a short distance of the sea. Efforts are being made to form new forests in its native country, but there are few places in the British Isles where the tree would be likely to succeed out of doors.

XXXVI.—LAELIA CAULESCENS.

R. A. Rolfe.

There is a group of small-flowered Brazilian Laelias whose history is in much confusion, chiefly on account of the paucity of material on which the species were based and the subsequent difficulty of identifying them. One of these is *Laelia caulescens*, Lindl. (originally described from the Herbarium of Martius), the type specimen of which is preserved in the Herbarium of the Kgl. Botanischen Museum at Munich. Owing to the uncertainty about this plant, application was made to Prof. Dr. L. Radlkofer for the loan of the original specimens, and it may be interesting to put on record the results of comparison with the allied species.

Laelia caulescens, Lindl., was described in 1841 (Bot. Reg. xxvii. sub t. 1), from materials collected by Martius in the Serra de Piedade, Prov. Minas Geraes, Brazil. It was said to be very near *L. cinnabarina*, Batem., but with the flowers apparently purple, and the lip perfectly destitute of all elevations or inequalities. A year later Lindley considered *L. caulescens* to be synonymous with his *L. flava*, described three years previously (Bot. Reg. xxv. Misc. p. 88) and then thought to be native of Mexico. He added that he had also a fine specimen collected by Gardner in elevated rocky places in the Serra do Frio in the Diamond District of Brazil (Bot. Reg. xxviii. t. 62). The identification of *L. caulescens* with *L. flava* is only correct so far as Gardner's specimen is concerned.

When Lindley originally described *Laelia caulescens* he remarked: "In the herbarium of von Martius is a similar plant from the same locality, with a three-flowered raceme and much shorter leaves; apparently it is a mere variety." Reichenbach referred this plant doubtfully to his *Bletia rupestris* (Xen. Orch. ii. p. 59), which is a synonym of *Laelia rupestris*, Lindl., and in a note under *Bletia caulescens* (p 60) he specially alludes to a specimen of it at Munich, on which Lindley had written "*Laelia caulescentis var.*? *an species diversa*?" This specimen he has definitely labelled "*Bletia rupestris*, Rchb. fil.," but it is certainly not *Laelia rupestris*, Lindl., which is a taller, more robust plant, with larger flowers. The same specimen Prof. Cogniaux has referred to *Laelia longipes*, Reichb. f., and I believe correctly, for it has the dwarf habit and floral structure of that species, while Martius has definitely recorded the colour of the flowers as "purpureo-violaceis." The original of *Laelia longipes*, Reichb. f. (*Bletia longipes*, Reichb. f., Xen. Orch. ii. p, 59), came from Brazil (Sellow, 1413) and is preserved at Berlin. There is a similar specimen in Lindley's Herbarium labelled "*Laelia caulescens*, Lindl., Brasilia, Sellow," but without any number, the name being written by the distributor, and apparently accepted by Lindley as correct. It, however, agrees only with the shorter-leaved plant alluded to by him.

The true *Laelia rupestris*, Lindl., is a quite distinct species, which was collected by Gardner in rocky plains in the Diamond District, Prov. Minas Geraes, Brazil, in 1840, and described two years later (Bot. Reg. xxviii. sub. t. 62). It closely resembles *L. flava*, Lindl., in habit, but has violet-purple flowers. We have seen that a specimen of Martius referred here by Reichenbach belongs to *Laelia longipes*, Reichb. f., but he also confused it to some extent with *Bletia caulescens*, Reichb. f., for in a note under the latter (Xen. Orch. ii. p. 60), he remarks that a plant which was cultivated by Makoy in 1885, under the name of *Brassavola violacea*, agrees exactly with the *Laelia rupestris* delineated in Lindley's Herbarium. Now this figure is a coloured drawing of the lip of a flower that was sent to Lindley from the Trinity College Botanic Garden, by J. T. Mackay, in May, 1845, and is believed to have been from a plant collected by Gardner.

This leaves *Laelia caulescens*, Lindl., as a distinct species, as it was also regarded by Reichenbach, who, however, failed to clear up its history. Cogniaux also (Mart. Fl. Bras. iii. pt. v. p. 281, t. 65, fig. 2) considers *L. caulescens*, Lindl., to be distinct, and adds the localities Sierra de Lapa, Riedel, 99, and S. E. Brazil, Sellow, 910. The former I have not seen, but there is an unnumbered specimen collected by Sellow, and sent from Berlin to Sir William Hooker, which I suspect to be identical with the latter. The one other specimen preserved at Kew is Glaziou, 17,271, collected in the province of Minas Geraes. Besides the confusion already pointed out, there is a note (Xen. Orch. ii. p. 60) that Gardner 5197, 5198 apparently belonged to *Bletia caulescens*, which is clearly erroneous. It is probable that 5198, 5199 were intended, but the former is *Laelia flava*, Lindl. and the latter *L. rupestris*, Lindl. Reichenbach also added a *Bletia caulescens*, var. *Libonis* (Reichb. f. Xen. Orch.

ii. p. 60), based on a specimen collected in the Province of Minas Geraes, Brazil, by Libon. I have not seen it, though from the two-leaved pseudobulbs and other characters I believe a plant collected by Dr. Stephen and preserved at Kew to be identical. The locality is given as "Sao Joao d'El Rey, 3500–5500 ft., Prov. Minas Geraes." The colour is not recorded, but the flowers appear to have been purple in the living state.

It is quite clear that *Laelia caulescens*, Lindl., is distinct from *L. flava*, Lindl., but the history of the former is still imperfect. The original specimen is taller than those subsequently collected, being over two feet high, with the leaf five inches long and the scape bearing as many as twelve flowers. There is no note of their colour. Lindley's remark that the lip is destitute of elevations is erroneous, as was pointed out by Reichenbach. There are other Brazilian species from the same region with small flowers and a much crisped lip, but none that appear to have been confused with *L. caulescens*. It would be interesting if someone would re-collect these plants, paying particular attention to the conditions under which they grow and the colour of the flowers.

XXXVII.—PARA RUBBER.

(*Hevea brasiliensis.*)

The following correspondence relating to the variety of *Hevea brasiliensis* planted in the Orient has passed between the Director of Agriculture, Federated Malay States, and the Director of the Royal Botanic Gardens, Kew :—

Kuala Lumpur,
1st April, 1913.

Sir,

In a report by the Brazilian Commission on the Rubber Industry the statement is made that the rubber planted in the Orient is almost entirely from seed of a "white" variety of *Hevea brasiliensis* (?), which like the "red" variety produces weak rubber, while the best rubber is produced by a so-called "black" variety, this growing on higher and drier land than the others.

It does not seem at all probable that the statement is correct, but I should be greatly obliged if you could give me any information from the botanical side which would tend either to support or discredit a statement which is calculated to cause a certain amount of uneasiness among those interested in Eastern plantation rubber.

I am, &c.,

L. Lewton Brain,
Director of Agriculture.

Royal Botanic Gardens, Kew,
April 30th, 1913.

SIR,

I HAVE the honour to acknowledge receipt of your letter No. 382/1913, dated 1st April, 1913, on the subject of two statements made by a Brazilian Commission on the Rubber Industry, viz. :—

(*a*) that the rubber planted in the Orient is almost certainly from seed of a "white" variety of *Hevea brasiliensis* ;

(*b*) that this variety of *Hevea brasiliensis* produces a weak rubber.

2. It is to be presumed that whether it was or was not the intention of the parties making this statement to cause a certain amount of uneasiness among those interested in Eastern plantation rubber it would not be unpleasing to those interested in Brazilian rubber if the statement were correct.

3. You enquire whether there is any information from the botanical side which would tend either to support or discredit these two statements.

4. In reply I have to observe that a feature of difficulty is imparted to the question by the use in the report of the Brazilian Commission of the term variety without any opportunity of learning what significance is to be attached to the term. If the Commission has employed this term in a scientific sense we are without any clue as to what characters have been relied upon by the Commission in distinguishing the three varieties they mention from each other. It is further to be noted that the Commission does not discriminate a "typical" variety, nor do they, as an alternative to this omission, state which of the three varieties *white*, *red* or *black* they would treat as typical *Hevea brasiliensis*. Their treatment of the question, however, is such as to lead to the conjecture that "variety" is employed in their report in a colloquial, as opposed to a scientific, sense and that the *white*, *red* and *black* varieties mentioned by you are in fact the "seringueira branca," "seringueira vermelha" and "seringueira preta" respectively of Brazilian travellers.

5. Assuming this to be the case we are informed (see Dr. J. Huber, in Bol. Mus. Goeldi, vol. iv. p. 639), that the *white* and *black* "seringueiras" are botanically scarcely separable from typical *Hevea brasiliensis* while the *red* "seringueira" represents the scientific variety of *H. brasiliensis* distinguished by Huber as var. *stylosa*. However, according to Dr. Ule, there are *two red* "seringueiras." One of these is *Hevea brasiliensis* var. *stylosa*, Huber, and the other is *Hevea cuneata*, Huber ; the latter is the Itaubé of Brazil. Dr. Reintgen (in Tropenpfl. vol. vi. Beih. no. 2[illegible] [1905], p. 105) has stated that the *red* variety, or Itaubé, is the most important and best known economically ; Dr. Huber on the other hand declares that Itaubé yields a product of less value than the *white* or the *black* "seringueira." This latter discrepancy may indeed owe its existence to the circumstance that there are, as Ule points out, two quite distinct *red* "seringueiras" and that while Huber had one, Reintgen may have had the other in view.

6. However this may be it is clear that the scientific botanists who are at work in Brazil have not yet been able to come to a

common understanding as to the relative economic value and status of the three sorts of "seringueira" spoken of in your letter as *red*, *black* and *white* varieties. But the evidence, such as it is, points to only the *red* as being distinguishable botanically from typical *H. brasiliensis*. The *black* and the *white*, so far as the available evidence goes are not varieties in a scientific sense; they appear only to be different states of the same type, the particular state which is of most value being that which grows on higher and drier land than the other.

This last statement of the Commission thus qualified is in complete accordance with what has always been understood with regard to *Hevea brasiliensis* and we have no reason to doubt the strict accuracy of the statement (see Wickham, Para Rubber, pp. 5 and 61), that the whole of the *Hevea* seed originally introduced to the East came from trees which grew under the conditions thus indicated by the Brazilian Commission.

I am, &c.,

D. Prain.

Kuala Lumpur,
27th May, 1913.

Sir,

I have the honour to thank you for your letter dated April 30th, with reference to the varieties of *Hevea brasiliensis*, and for your clear explanation of the question.

Perhaps the attached letter from Dr. C. J. J. van Hall with reference to the trees at Pasir Oetjing (which were said to be the only ones in the East belonging to the "black" variety) may interest you.

I am, &c.,

L. Lewton Brain.

Buitenzorg, den 16, Mei, 1913.

Dear Mr. Lewton Brain,

The result of the investigation at Pasir Oetjing about the "black variety" is as folllows :—

All the Hevea-trees at this plantation originate from seeds from the F.M.S. (Valombrosa, &c.) except the oldest ones, planted 8 years ago. No difference is to be seen between the first mentioned trees and the Hevea-trees on other plantations in Java. As regards the 8 years old trees, these are about 1500 in number, they have been bought from Godefroy-Lebeuf (Paris), who got the seeds from Brasil.

Dr. Rutgers went to Pasir Oetjing to investigate these Heveas. Their appearance is a little different from that of the common type, the bark of all being very smooth and more greyish or whitish; the bark is thin. The yield is poor and decidedly below the average. In the leaves there is as much variation as always among Hevea-trees and nothing particular could be found.

It thus turns out that a number of trees could be found at Pasir Oetjing, which had another origin than the common type in Java and the appearance of which was slightly different, while the yield was poor. If a name ought to be given to this "variety" we must call it "white," not "black."

Yours very truly,

VAN HALL.

Kuala Lumpur,
29th May, 1913.

SIR,

WITH reference to my letter of the 27th instant, Dr. van Hall informs me that the Pasir Oetjing trees are 13 years not 8 years old.

I am, &c.,

L. LEWTON BRAIN.

XXXVIII.—VARIETIES OF PLANTAINS AND BANANAS CULTIVATED IN SEYCHELLES.

The following account of the varieties of Plantains and Bananas cultivated in the Seychelles has been received from Mr. P. R. DUPONT, Curator of the Botanic Station, Seychelles:—

There are so many Africans among the labouring classes of the community that banana cultivation has spread all over the Archipelago; and in many localities, banana eaters, as the Africans are sometimes called, have developed the culture of this plant to such an extent, that one can say that it ranks in production next to the coconut in Seychelles.

The following are the varieties generally cultivated:

1. The Chinese banana (*Musa Cavendishii*) called locally "banane gabou," which is eaten raw. It is planted in depressions of ground where moisture accumulates, and will not stand stiff laterite soil. It is attacked by the weevil (*Sphenophorus striatus*). This is the only type of dwarf banana planted in Seychelles. Among the tall plantains (so called), there are several varieties which are eaten raw in the ripe state, although most of them are eaten cooked when unripe. The three following varieties are never eaten raw; and, when prepared in coconut milk, are considered a delicacy even by Europeans and other residents.

2. Banane Malgache.
3. Banane St. Jacques.
4. Banane Simeroë.

These three varieties belong to the Congo type, and two of them were cultivated two years ago for the production of banana flour.

Nos. 3 and 4 are different from No. 2 which always possesses the terminal bud of unopened flowers and bracts at the end of the fruit stalk. This is the best of the type. Nos. 3 and 4, Banane St. Jacques and Simeroë are very nearly allied species and are distinguished from No. 2. principally by the absence of the terminal

"bud." The hands are fewer in number than in Banane Malgache, and many planters are of opinion that the number of "fingers" serves to distinguish between "Simeroë" and "St. Jacques," the former being a degenerated type of the latter, and the whole bunch being replaced by one or two enormous fingers. These three plantains possess a tall pseudo-stem with reddish blotches along the petioles and the upper part of the stem. This colouring of the stem and petioles is exactly the same in the three varieties, and is more or less pronounced according to exposure to the sun. The three plantains in question are badly attacked by the weevil, and are mostly cultivated in rich ground, being more exacting than the other more common varieties.

5. There is another plantain of the Congo type called locally Banane "Barbare" which is eaten raw. Its fingers are sometimes quite as long as those of Banane Malgache or St. Jacques, but the stem possesses blackish blotches, and the leaves are generally broader and longer than in the other two types. This plantain is also attacked by the weevil.

The other bananas are generally eaten raw, except when unripe, and when no other cheap food, such as cassava, &c., is available.

6. Banane "Mille."—This is a tall plantain of the Malay type which is very hardy and not attacked by the weevil. The pseudo-stem possesses blackish blotches, and the bunch is very long with large numbers of short fingers; hence its name. The bunch is sometimes double or treble, and for this reason it earns the name of "elephant's trunk" banana. But this is a case of teratology which has been described elsewhere as well. The fingers develope near the stem end of the stalk, then a few flowers remain sterile, and after a time other flowers develope into a secondary bunch along the same stalk. This variety is very often planted and the fruits exported, as even in the young stage of growth the bunches keep a long time and turn yellow.

7. Banane "Mignonne"—This is a delicious small banana which is said to have been introduced from Reunion Island. The plant is tall, and the pseudo-stem is coloured brown. The fingers are small, but the flesh is hard and highly flavoured. It is a favourite on the table together with the two following varieties.

8. Banane "Tahiti"—A very small banana which is delicious and considered best for the table. It was introduced from Mauritius. The plant is intermediate between plantains and dwarf bananas, and the stem is slender like all the other parts of the plant; pseudo-stem brownish.

9. Banane "Gingeli" or "Figue"—Introduced also from Reunion or Mauritius. A delicious fruit, and much bigger than the other two varieties. Its culture is however limited owing to the attacks of weevils. The pseudo-stem is reddish, nearly of the same colour as those of the Congo type.

10. Banane "Carré"—The fruits of this variety possess four pronounced ridges—hence its name. They are loosely clustered on the bunch and generally eaten cooked. They produce a good yellow-coloured starch on being dried. The pseudo-stem is light green in colour, with green blotches on the lower part of the petioles.

11. Banane "Quatre vingt" or "Galega" or "Australie" or "Duperrel"—said to have been introduced by Mr. Duperrel from Australia. It is a very hardy plantain, but the fruits are of small size and of about the same shape as banane carré. Like the latter, it is immune from the weevil and for this reason occupies a more important place than it deserves. Its fruit is quite inferior. It is nearly allied to banane carré as far as characters of colouring of the stem and petioles are concerned.

12. Banane "Rouge"—The name is derived from the beautiful red colour of the fruits which are eaten raw or cooked and generally appreciated. The stem is also deeply red coloured, and for this reason the plant is ornamental.

13. Banane "Monsieur"—This is a variety certainly derived from the latter, the stem and fruit being the same size and shape, and various shades of colouring showing clearly the derivation of the one type from the other. Sometimes several hands are still coloured red, and the others are green, and the same may be said of some parts of the stem.

14. Banane "Blanche"—This is one of the two types which stand the cool climate of the summits, the other is :

15. Banane "Noire"—The one variety is derived from the other, just in the same way as banane Monsieur is derived from banane Rouge. Banane noire possesses a deep colouring in black of the stem and leaves, and the colour of banane blanche is lighter, but of the same blackish tinge. The same blackish colouring is sometimes found in banane barbare, and it seems that incidental variations in colour are very often due to the climate of this Colony.

Banane mille, noire, blanche, carré, quatrevingt, rouge, monsieur, are immune from the weevil, but I have noticed in a few of these varieties signs of a fungoid or bacterial disease which discolours in red the internal tissues of the pseudo-stem and causes the death of the plants. This disease was known long ago, and is propagating very slowly.

There are only one or two specimens of banane "graine" (a tall plantain which produces fruits containing seeds) newly introduced.

XXXIX.—SISAL HEMP IN FIJI.

In the *Kew Bulletin* for February 1892, p. 37, it is recorded that at the request of the Governor, Sir John Thurston, plants of the various species of *Agave* yielding fibre were forwarded for cultivation to the Botanic Station at Suva, Fiji. Notwithstanding the long period necessary for the transit of the plants, via Sydney, they arrived in good condition and were subsequently reported to have made satisfactory growth.

Since then there has been a great development of the cultivation of Sisal which has been rewarded with success. The following particulars giving the history of the establishment of the Industry in Fiji are gathered from Bulletin No. I. 1911, of the Department of Agiculture by Mr. C. H. Knowles, Superintendent of Agriculture. Since the establishment of the Department in 1907 Sisal Hemp has been cultivated at the Experimental Stations at Nasinu near

Suva and at Lautoka on the north west coast of Viti Levu, the supply of suckers and pole-plants necessary to form the experimental plots having been obtained from the local Botanic Gardens and in addition a small number of pole-plants was obtained from Honolulu.

At the Nasinu Station the surrounding country is generally hilly and the particular block upon which the Sisal plants were set out consists of a low hill with a red soil described as a heavy loam about one foot deep, the subsoil containing more clay to a depth of about ten feet and well-drained naturally.

The plants were put out in rows eight feet apart, the same distance being allowed between the plants in the rows.

In March 1910 a hurricane did considerable damage to the crop and so far as could be estimated some 40 to 45 per cent. of the leaves were rendered useless for fibre production, but fortunately the damage only affected the crop for that particular year.

The first cutting took place in October 1910 and it was calculated that with 681 plants to the acre the yield of fibre would amount to 1228lbs. According to the Report of the Department of Agriculture for 1911 published in 1912 the total yield of Sisal from the plot was 2499 lbs. to the acre for the two cuttings in March–June and December. The percentage of fibre tends to increase with the age of the plants, the first cutting gave 3·25 per cent., the second 3·76 per cent. and the third cutting 4·24 per cent., similar results were obtained at Lautoka. The average rainfall at Nasinu for the five years ending 1911 was 130·49 inches per annum.

At the Lautoka Station which is situated within the "dry zone" the average rainfall for the same period as that given above was 71·66 per annum. At this Station the method of planting was the same as that adopted at Nasinu. An experimental plot, previously ploughed, was planted in June 1907. This plot was situated on the slopes of a low hill with dark chocolate-coloured soil, eight to ten inches deep and lying on partially disintegrated sandstone and well-drained naturally. In April 1910 six rows of Hemp plants were considered fit to cut, the plants then being two years and ten months old. It was decided to cut one row at a time, allowing intervals between the treatment of the different rows to determine the improvement with age. The following table shows the figures actually obtained. :—

Row.		Date of Cutting.	Leaves.		Weight of Fibre.	Weight of Tow.
No.	No. of Plants.		Number.	Weight.		
		1910.		lbs.	lbs.	lbs.
1	32	April 23	1,423	1,984	46	15
2	31	May 2	1,403	1,864	49	16
3	31	Oct. 20	Not counted	2,367	66	18
4	31	Nov. 4	Not counted	3,180	75	
		1911.				
5	32	Jan. 18.	Not counted	2,607	69·5	19
6*a*	32	Jan. 24.	1,926	3,289	87	
6*b*	32	Jan. 24.	443	961	27	

In the first cutting all the leaves were removed up to an angle of 45° and all those under 3 feet long were discarded. The hurricane in March was not severely felt in the Lautoka district and the Sisal-hemp plants suffered no injury.

In row 6 the line of figures marked (*a*) refers to the leaves cut up to an angle of 45°, but it is desired to test the effect of systematic severe cutting and further leaves were removed leaving only eight on each plant besides the central spike. The extra leaves so removed are referred to in line marked (*b*).

Other figures are given in the Bulletin but from the foregoing it will be seen that Sisal plants flourish in Fiji under dissimilar conditions.

In a communication recently received from the Colonial Office it is of interest to find that the industry appears to be on a sound footing and that during the present year 10 tons of the fibre have already been exported.

XL.—MISCELLANEOUS NOTES.

Mr. Philip Valentine Osborne, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, a probationer gardener for service in India.

Nicholas Holtze.—It is with great regret that we have to record the death of Mr. Nicholas Holtze, Curator of the Experimental Garden, Port Darwin, Northern Territory, South Australia.

Mr. Holtze had filled several important Government posts and had earned the reputation of being a thoroughly competent and conscientious public official. He was moreover a man of tireless energy and an ardent and capable botanist.

He was particularly helpful to settlers and was always ready to further their interests by advice. In this connection his researches into the suitability of the country for the growth of rice, sisal, rubber, cocoanuts, sugar, &c., were of particular value, and this side of his work is emphasised in his Reports to Government.

Mr. Holtze was born in Russia in 1868 and came to Australia with his parents when he was five years old. When his father (Dr. Maurice Holtze) was appointed to succeed the late Mr. Schomburgh as Director of the Botanic Gardens at Adelaide in 1891, Nicholas Holtze was placed in charge of the Government Gardens in the Northern Territory in succession to his father.

He was taken ill during a botanical expedition to the Katherine river and though able to be brought back to Darwin he never rallied and died on May 26.

Crataego-mespilus Dardari.—In the *Kew Bulletin*, 1911, p. 267, an illustrated account of this graft hybrid and its companion of similar origin, *C.-m. D'Asnieresii*, was given. They both originated at Bronvaux, near Metz, from shoots borne on a tree of common medlar grafted on hawthorn. Of the two, the latter is the more beautiful as a garden tree, but *C.-m. Dardari* is the more interesting in having (like *Laburnum Adami*) the faculty of producing several types of growth on the same individual. At the time the article

in the *Bulletin* was published, the specimen of *C.-m. Dardari* in the Kew collection carried a branch of pure medlar and one of *C.-m. D'Asnieresii*; but no branch of true hawthorn, the other parent, had appeared, nor has it done so up to the present. Mr. Vicary Gibbs, however, on May 27th. last was kind enough to forward to Kew from his remarkable collection at Aldenham a flowering spray gathered from *C.-m. Dardari*. This spray is *Crataegus monogyna*—the form with hairy flower stalks, calyx-tube and receptacle distinguished by Beck as var. *lanigera*. Mr. Gibbs observes that the flowers, borne on a shoot 3 feet long, were fully open on May 27th., whilst the rest of the tree had only unopened buds of the white, medlar-like blossoms characteristic of *C.-m. Dardari*. A shoot of true medlar has since been found on the tree.

Thus this graft hybrid shows a phenomenon, unique so far as we are aware, of one kind of tree (not as yet, however, one individual) producing four types of growth, two of which are distinct species and two of a hybrid or intermediate nature. They may be tabulated as follows:

1. *Crataegus monogyna* } parent species.
2. *Mespilus germanica* }
3. *Crataego-mespilus D'Asnieresii*, hybrid approaching No. 1.
4. „ „ *Dardari* „ „ No. 2.

Laburnum Adami has not been known to produce more than one hybrid type of flower besides those of its two parent species (*Laburnum vulgare* and *Cytisus purpureus*) three in all.

Botanical Magazine for May.—The plants figured are *Rhododendron Wightii*, Hook. f. (t. 8492); *Deutzia longifolia*, Franch. (t. 8493); *Strongylodon pseudolucidus*, Craib (t. 8494); *Dendrobium Schuetzei*, Rolfe (t. 8495); and *Saxifraga Stribrnyi*, Velenovský (t. 8496).

Rhododendron Wightii is a Sikkim species with large broadly lanceolate leaves, which are densely covered on the under side with a cinnamon-brown tomentum, and loose heads of straw-yellow flowers spotted with deep red. The material for the figure was obtained from a plant which flowered in the Himalayan House at Kew in April 1911. This plant was raised from a graft procured from a fine specimen which is growing outside in the garden of Miss A. Mangles at Littleworth.

The *Deutzia* is an attractive free-flowering species from Western China, whence it was originally introduced into cultivation by Messrs. J. Veitch & Sons in 1902, and has been distributed under the name of *D. Veitchii*. It is a hardy shrub 3–7 ft. high, with lanceolate serrulate shortly petiolate leaves, and compact inflorescences of more or less rose-coloured flowers nearly an inch across. The figure was prepared from material obtained from one of the plants grown at Kew from seeds received from Professor Sargent of the Arnold Arboretum in 1908.

Strongylodon pseudolucidus is a new leguminous climber for the warm conservatory, and is distinguished from *S. lucidus*, Seem., by its much larger bracts and bracteoles and smaller flowers, which are red and about an inch long. It is a littoral species found in Ceylon, the Andaman Islands, Christmas Island, New Guinea, New Caledonia

and North Australia, and extends westward to Madagascar, whence seeds were sent to Messrs. Charlesworth & Co., of Haywards Heath.

Dendrobium Schuetzei is a handsome species from the Philippines and is allied to *D. Dearei* Reichb. f., from which it differs in its shorter pseudobulbs and much larger flowers with a shorter obtuse mentum. The material for the figure was provided by a plant purchased for Kew from Messrs. F. Sander & Sons who introduced the species, and by photographs supplied by them. A plant flowered for the first time at St. Albans in September 1912.

Saxifraga Stribrnyi, a native of Bulgaria, is a small-growing species most nearly allied to *S. media*, Gouan, from which, however, it may be easily distinguished by its more branched inflorescence and nodding flowers. The plant figured was purchased from Mr. Sundermann, of Lindau, Bavaria.

Botanical Magazine for June.—The plants figured are *Rhododendron Augustinii*, Hemsl. (t. 8497); *Hypericum aureum*, Bartram (t. 8498); *Amelanchier oligocarpa*, Roem. (t. 8499); *Osbeckia stellata*, D. Don (t. 8500); and *Agave Warelliana*, Baker (t. 8501).

Rhododendron Augustinii is one of the numerous species which, during the last few years, have been introduced into cultivation from China, where, it is now known, the genus has its head-quarters. *R. Augustinii*, first discovered by Prof. Augustine Henry, is recorded as having flowered in the garden of Mr. M. L. de Vilmorin at Les Barres in 1904. The Kew plant from which the material for the figure was obtained was procured from Messrs. James Veitch & Sons in 1908, the stock in the Coombe Wood nurseries having been raised from seed collected by Mr. E. H. Wilson. The species has been found in Hupeh and Szechuen, and in cultivation proves to be one of the most hardy and free-flowering of the new Chinese Rhododendrons.

Hypericum aureum is an old garden plant, a native of the South-Eastern United States, and remarkable in forming a distinctly woody stem. It is valuable from the fact that its rather large yellow flowers are produced in August when few woody plants are in bloom.

Amelanchier oligocarpa is the dwarfest species of the genus, and by its dwarfness and its few-flowered inflorescences is easily distinguished from *A. canadensis* under which name it is often found in collections. Being a native of cold swamps and mountain bogs from Labrador southward to the shores of Lake Superior and the northern portion of New York State it is extremely hardy in this country. The material for the figure was obtained from a plant received at Kew from the Arnold Arboretum in 1910.

Osbeckia stellata was in cultivation in England nearly a century ago, and was figured in the Botanical Register in 1822 under this name, while it appeared in some gardens as *O. speciosa*. It is distributed from the North-Western Himalaya to China, and the plants now in cultivation at Kew were raised from Sikkim seeds communicated by Major Gage, Superintendent of the Royal Botanic Garden, Calcutta.

The *Agave* is an attractive Mexican species belonging to the section *Littaea*, and to that group in which the flowers are tubular, with recurved segments. It has been known in gardens for many

years, but it is uncommon. In 1912 it flowered in Lady Hanbury's garden at La Mortola and in the garden of Professor G. Roster at Ottonella in the Island of Elba. The figure was prepared from material obtained from La Mortola.

Botanical Magazine for July.—The plants figured are *Poduchaenium eminens*, Baill. (t. 8502); *Sedum pilosum*, Bieb. (t. 8503); *Cunonia capensis*, Linn. (t. 8504); *Crotalaria agatiflora*, Schweinf. (t. 8505); and *Vinca difformis*, Pourr. (t. 8506).

Poduchaenium eminens has been in cultivation for over seventy years. It is an interesting monotypic genus from Central America rather closely related to *Verbesina*, Linn., but readily distinguished by its opposite leaves and stipitate achenes with few pappus scales. In its native country, S. Mexico to Costa Rica, it ranges from 3000 to 6500 feet.

The *Sedum* is a charming rosy-pink-flowered biennial and is distinct from allied species in its flower colour. Indeed from its general appearance it might be considered a *Crassula* but this is not borne out by the floral morphology. The plant is a native of the Caucasus where it grows at heights of from 4000–5000 feet above sea level.

Cunonia capensis is a plant formerly to be found in cultivation but now rarely met with. We are indebted to Prof. Dixon for the specimen figured which flowered in the garden of Trinity College, Dublin last year. *Cunonia capensis* is a fairly abundant tree in S. E. Africa where it is known to settlers as Red Alder. All the other species of the genus are natives of New Caledonia.

The subject of the next plate is one of the finest of the African species of *Crotalaria* and is a native of British East Africa and Uganda. The specimen figured was submitted to Kew for identification from Pylewell Park, Lymington, where it was grown for the first time in this country. The flowers resemble those of *C. laburnifolia*, but they are very much larger.

The Periwinkle, *Vinca difformis*, is a native of the Western and Central Mediterranean region where it is to be found in moist and shady places. The specimen figured was sent to Kew by Canon Ellacombe, who has grown it for many years in his garden at Bitton. It is not so hardy as *V. major* or *V. minor* but it is a useful plant for warm localities especially as it flowers through the winter.

Kapok in Tropical Africa.*—Kapok is the wool lining the capsules of various species of *Ceiba* (*Eriodendron*) and *Bombax*. The principal area of production is the Dutch East Indies, and Java in particular. In 1906 the Kapok exported from the Dutch East Indies amounted to 6257 tons (at least 5790 tons being from Java), and in 1911 to 9960 tons. British India yielded about 1000 tons in 1909.

In the last few years a small but steadily increasing amount has come from Tropical Africa, principally from Togo and German East Africa, where extensive plantations are being made. In 1911

* Die Kapok liefernden Baumwollbäume der deutschen Kolonien im tropischen Afrika. E. Ulbrich. (Notizbl. Bot. Gartn. Berlin, vol. vi. 1913, pp. 1–34.)

about $2\frac{2}{3}$ tons (2760 kilograms), mostly of wild Kapok, were exported from Togo, and this amount will increase greatly in the near future when the plantations come into bearing.

By far the greatest amount of Kapok is the produce of the Silk-cotton Tree, *Ceiba pentandra*, Gaertn. (*Eriodendron anfractuosum*, DC.), which is the only species cultivated to any extent, and of which innumerable forms occur in the tropics.

The various kinds of Kapok known from Tropical Africa may be grouped in two categories.

The first group includes those with snow-white, dirty white or grey wool, composed of slender soft and long hairs. The seeds are somewhat pear-shaped and 6–10 mm. in length. The following species yield Kapok of this kind: *Ceiba pentandra*, Gaertner, *Bombax buonopozense*, Beauv., *B. angulicarpum*, Ulbrich, *B. flammeum*, Ulbrich, *B. reflexum*, Sprague, and *B. Buesgenii*, Ulbrich.

The second group is characterised by a yellowish, reddish-brown or dark brown wool composed of more brittle, stiffer and shorter hairs. The seeds are globose or cylindric and 1·2–1·8 cm. in diameter or length. The only two species known are *Bombax rhodognaphalon*, K. Schum., and *B. brevicuspe*, Sprague.

Kapok is used for stuffing cushions, mattresses and lifebelts. For the latter purpose its great buoyancy renders it superior to cork. The reddish brown kind yielded by *Bombax rhodognaphalon* has been used recently in paper-making, and has proved to be suitable for the manufacture of coloured blotting-paper.

The seeds yield an oil suitable for lubrication and soap-making, and the residue after expression of the oil may be utilised as a manure.

Wild Kapok is of little importance for the world's supply on account of the relatively small and uncertain amount of the yield, and the soiling of the wool which is due to the capsules having to be picked from the ground after they have ripened and fallen on account of the great height and spiny nature of the trees.

In the plantations the young Kapok trees (*Ceiba pentandra*) are usually raised from cuttings. Branches as thick as a man's arm are cut off and planted 3–4½ ft. deep in the ground, and stripped of their leaves. They grow quickly and usually give rise to spineless trees, which come into bearing rather earlier than seedlings. When the trees grow too high they are lopped in order to facilitate the collection of the fruits and to give more light to the trees planted in between.

Seedlings are transplanted from the seedbeds after 6–12 months or, preferably, after 18–24 months. The young plants grow rapidly if they are stripped of leaves and lopped at about 1½–2 ft. above the ground. Growth is then very quick, and the trees commence to yield when they are 4–6 years old. Reproduction by seedlings is apt to be unsatisfactory, as the results are much less certain than by cuttings, and spiny forms are apt to occur. The best work on Kapok cultivation is G. F. J. Bley's 'De Kapokcultuur op Java.'

The Kapok plantations do not appear to be affected to any considerable extent by parasitic fungi. They suffer, however, from the attacks of several insects, of which the most harmful are the red bugs, *Dysdercus* spp., which live in the fruits and destroy the wool.

Among other insects which injure the fruits are species of *Earias* and *Helopeltis*. Quantities of the young fruits are destroyed by flying foxes.

The beetle *Batocera hector* bores into the trunks and sometimes kills young trees. When a tree attacked by it is found, the holes should be filled with benzine and stopped with clay.

Great damage is done to the Kapok plantations in Java by various kinds of mistletoe (*Loranthaceae*), but nothing is yet known as to the extent to which the Kapok trees are affected by these parasites in Africa.

Dr. Ulbrich's paper concludes with a systematic account of the African Kapok-yielding species. He distinguishes two main varieties of *Ceiba pentandra*: var. *clausa*, in which the fruits do not open until after they have fallen, and the prickles on the trunk are acute; and var. *dehiscens*, in which the fruits open while still on the tree, and the prickles of the trunk are rather obtuse. Both these varieties have forms with snowy white wool and with grey wool.

T. A. S.

The Solomon Islands Guada Bean.—Under the above heading a somewhat exaggerated note, culled from a New South Wales Agricultural Paper, recently appeared in "The Vegetarian Messenger and Health Review." From the description given of the plant and from several samples of seeds received for determination there is little doubt that the Common Snake Gourd, *Trichosanthes anguina* is the plant in question. This species is a scandent annual with an angled stem, much cultivated in the warmer parts of Asia for its fruit which is universally eaten by the natives in their stews and curries.

According to Duthie and Fuller in "Field and Garden Crops of the North West Provinces and Oudh," this plant in all probability had its origin either in India or in the Indian Archipelago. It has never been found in a wild state, unless it be considered, as has been suggested, to represent the cultivated state of *Trichosanthes cucumerina*, a common plant extending throughout India to North Australia.

The fruit of this vegetable is from 1 to 3 feet long, and of a very handsome appearance. When young they are beautifully striped with white and green, and on ripening change to a brilliant orange. The young fruit is used as a substitute for French beans. When cut into thin strips and boiled, they form a fair imitation of that vegetable. The fruit must be used when very young. If cut when more than 4 inches long they often have a very bitter taste. Under the heading of "A Wonderful Vegetable" seeds of this plant are advertised by a nurseryman of New South Wales at 3*s*. per packet of eight seeds. Models of the fruits are to be seen in Case 57, Museum No. 1.

J.M.H.

The Genus Marah.—When the revision of the genus *Marah* was undertaken (*see K.B.* No. 4, 1913, pp. 145–153) the short paper by Greene entitled "Reconsideration of the genus Marah"—Leaflets vol. ii, pp. 35, 36, 1910—was unfortunately overlooked. We are

indebted to Dr. J. N. Rose for calling our attention to this omission in consequence of which several corrections in the new combinations have to be made.

Kellogg in founding the genus *Marah* in Proc. Calif. Acad. i (1853), 37, considered the word *Marah* to be masculine and he has therefore been followed. Greene, however, has used *Marah* as a feminine word. In the following corrections of the new combinations the specific names are retained in the masculine :—

M. guadalupensis, Dunn, should be *M. guadalupensis*, Greene, Leaflets ii, 1910, 36.

M. Watsoni, Dunn, should be *M. Watsoni*, Greene, l.c.

M. muricatus, Dunn, should be *M. muricatus*, Greene, l.c.

M. oregonus, Howell, should not be altered, see Howell, Flora N. America, i (1897), 239.

M. macrocarpus, Dunn, should be *M. macrocarpus*, Greene, l.c.

M. fabaceus, Dunn, should be *M. fabaceus*, Greene, l.c.

M. gilensis, Dunn, should be *M. gilensis*, Greene, l.c.

M. Rusbyi, Greene, and *M. leptocarpus*, Greene, originally described under *Echinocystis* and *Micrampelis* respectively, but recombined under *Marah* by Greene in his paper, were similarly overlooked.

M. leptocarpus appears to be closely allied to *M. horridus*, Dunn, but specimens have not been seen. Its habitat is the Colorado desert in S.E. California.

M. Rusbyi, Greene (*Echinocystis macrocarpa*, Britton), comes from Bolivia and does not belong to *Marah* which has its southern limit in Lower California. The specimen in the Kew Herbarium received from Britton under the above name appears to be an *Echinopepon*.

S. T. D.

Allium triquetrum as a Vegetable.—In the 'Revue Horticole' of July 1st, 1913 (No. 13), p. 311, Fig. 111, Dr. L. Trabut, Director du Service botanique de l'Algerie, gives an illustrated account of the utilisation of *Allium triquetrum*, L., of which the following note is a translation :—

Allium triquetrum, L., which is very common on the Algerian littoral, especially in the neighbourhood of dwellings and in gardens, is much esteemed by the Kabyles who make use of it in large quantities during the winter.

This Allium is called 'Bibrous' or 'Bibraz' by the natives, a name by which the leek is also known. The plants are collected in great numbers by women in the hedgerows and fields.

Being anxious to ascertain the value of this vegetable I made some culinary trials. The whole plant during the winter takes the place of leeks in soups ; the odour is slight and pleasant ; the leaves are very tender and almost melt in cooking.

After this first trial I attempted the cultivation of the plant from seed at the Botanic Station, but experience quickly showed that in order to obtain plants as large and as presentable as good

leeks it was necessary to plant the wild bulbs at a sufficient depth (15–20 centimetres) at the end of the summer, for *Allium triquetrum* forms compact and extensive clumps.

The bulbs when isolated and planted deeply in good soil make a large plant during the winter, the buried portion of which is white, very delicate and most appetising. These plants when their green leaves have been removed make a very pleasant vegetable, without any trace of the smell of garlic or leek, and suitable with all sauces.

Such a complete transformation by cultivation of a useless weed invading gardens was quite unexpected. It is, however, sufficient to isolate the bulbs and to plant them deeply in order to obtain this great enlargement of the edible portion.

I do not hesitate to recommend *Allium triquetrum* so treated as a very interesting vegetable for gardens bordering on the Mediterranean.

Of the figures accompanying the note one represents a cultivated plant which has undergone neither selection nor mutation and another a spontaneously grown plant from the same soil, selected from among the best specimens.

The Root and Haustorium of Buttonia natalensis.—For many years Kew has been anxious to ascertain what might be the host plant of *Buttonia natalensis*, Macken. (*Scrophulariaceae*), which is said to be the handsomest climbing plant in Natal. Thanks to Dr. J. Medley Wood, Director of the Natal Herbarium, we have now received material of the roots of both host and parasite, preserved in formalin, which has allowed of an examination of the mode of attachment of the haustoria to be undertaken.

Buttonia is a rare plant confined to the coast district, and it is to Mr. W. J. Haygarth, who found some plants near Durban, that we are indebted for the material and for information as to the host plant.

The host plant appears to be almost certainly *Euphorbia grandidens* and the material sent by Dr. Medley Wood included several roots of the parasite with their haustoria attached to the roots of the *Euphorbia*.

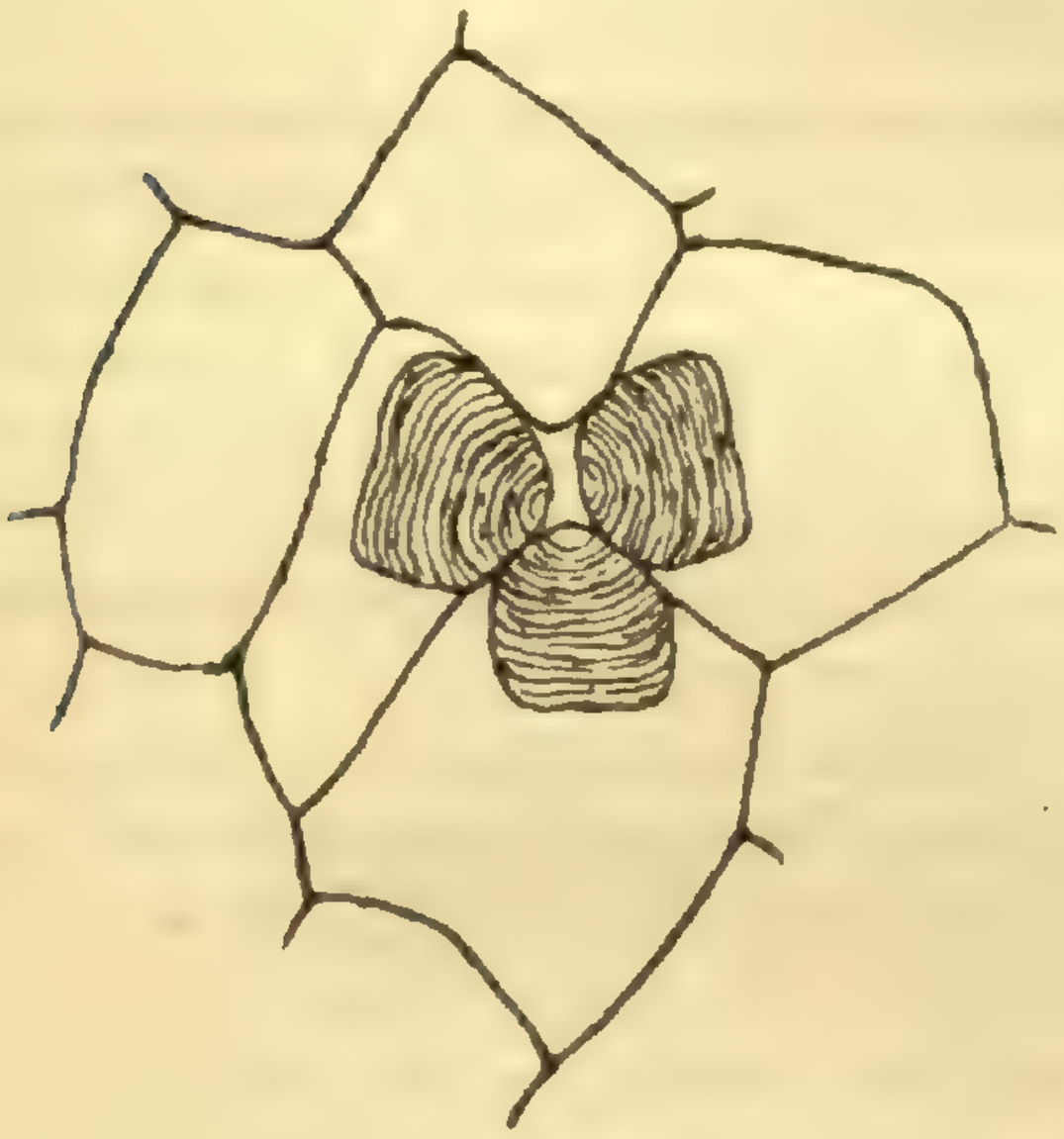
Some observations on this material are described in the following note.

A colouring matter is present in the root, and is interesting on account of its mode of occurrence. It is yellow, orange, or brown according to the degree of accumulation, and it appears to belong to the xanthic series of pigments. It dissolves in alcohol, but not in water, and in concentrated sulphuric acid it turns a dark blue colour. The pigment occurs as a granular mass filling the cavities of a few cells belonging to the phloem, and is also found in the form of granules in some of the cells of the primary cortex. The peculiarity of its occurrence, however, is that it is chiefly located in special thickenings of the cell-walls of numerous cells in the primary cortex, and here it has the appearance of a yellow or brown stain, no granular character being observable.

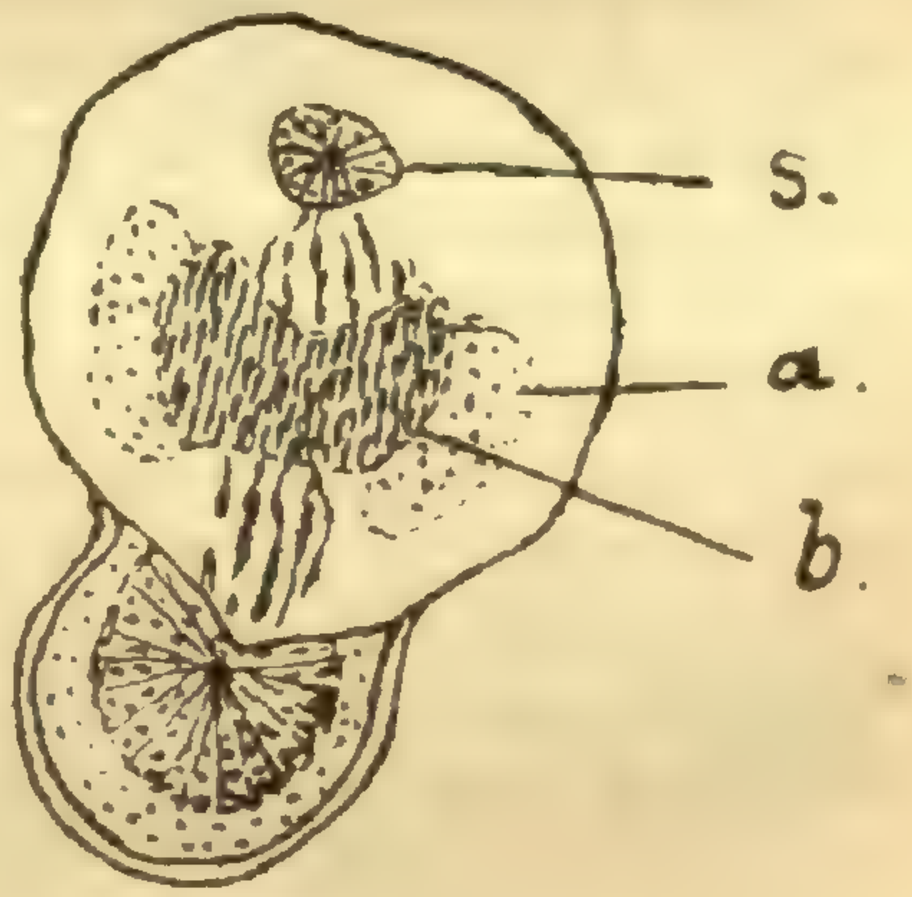
On dissolving out the pigment with alcohol, the thickenings are seen to have a stratified structure (Fig. 1) resembling that of the cellulose basis of some cystoliths. They are not, however, composed of cellulose, as they do not give a blue colour with iodine and sulphuric acid, or with Schulze's solution. Several other micro-chemical reactions were tried, and the results appear to indicate that the thickening-masses consist of some substance related to mucilage, but of a rather resistant character, and containing a slight admixture of protein.

A periderm is formed rather early in the root, and arises in the third or fourth layer below the surface. Between the periderm and the endodermis there are usually from four to six layers of cells representing the inner portion of the primary cortex. This is the region in which the cystolith-like thickenings occur. They are present in many of the cells and are generally attached to the cell-wall just where it borders on a small intercellular space, and thus are often arranged in groups of three or four (Fig. 1).

The colouring matter in *Buttonia* may be compared with that found in *Craterostigma pumilum*, another member of the *Scrophulariaceae*. In *Craterostigma* the pigment is red, but is to be classed with the xanthic series of compounds, and also has a peculiar mode of occurrence in the root. Here it occurs in granular form, and is found in intercellular spaces in the cortex, lying on the surface of the cell-walls bounding these spaces.*



1.



2.

FIG. 1. *Buttonia*, thickenings in cortical cells (× 390).
FIG. 2. Section through haustorium of *Buttonia* and root of host (× 10).

The haustorium of *Buttonia* attacks the root of the host-plant in the usual way, and penetrates the vascular cylinder of the latter (Fig. 2), eventually reaching the centre. In some cases the root of

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* Marshall Ward and Dale, Trans. Linn. Soc., 2 ser., vol. 5, p. 346.

the host is killed for a short distance, the cortex becoming locally withered and separated from the stele. In most of the cases examined the haustorium was still attached to living portions of the root on one or both sides of the dead part, so that parasitic nutrition could still be maintained.

The structure of the haustorium is shown diagrammatically in Fig. 2. The so-called nucleus of the haustorium has a central portion (*b.*) composed of numerous short tracheides mixed with parenchymatous cells. This is surrounded laterally by a zone of differentiated parenchymatous tissue (*a.*) apparently representing phloem. The greater part of this and of the central mass of short tracheides has been derived from a cambium lying between the two tissues. The central group of tracheides is connected with the stele of the parasite (*s.*) on one side, and with that of the host on the other by means of straggling tracheides, indicated by lines in the diagram. The type of structure is similar to that of the haustorium of *Exocarpus cupressiformis** and other root-parasites.

L. A. B.

List of Gold Coast Trees and Shrubs.†—The list is intended to assist Forest Officers in the bush. The sources of Mr. Chipp's information are his own collections and observations on the spot, and the rich collections of Gold Coast plants preserved in the Kew Herbarium.

The preface contains a short history of botanical exploration in the colony, with a list of the principal collectors from 1783 to the present date. About 330 species are included, and the systematic arrangement of the families is after that of Bentham and Hooker's Genera Plantarum, the genera being arranged alphabetically under their respective families. Only those plants are included which have been actually examined by the author. The full distribution of each species in the Colony is given so far as known, together with economic notes and notes on peculiarities of habit. Lists of English and of Native names with their botanical equivalents are included, and also an index to the botanical names quoted in the body of the work.

Mr. Chipp's work is an excellent beginning in a systematic study of the flora of the Colony. The book is well and clearly printed, and neatly bound in stiff canvas covers, the solution used in binding having been specially prepared in order to render it impervious to the ravages of insects.

Had a smaller page been adopted the book would have been more convenient for carrying in the pocket.

J. H.

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* Benson, Root Parasitism in *Exocarpus*. Ann. Bot., vol. 24, p. 670, Text-figure 2.

† A List of Trees, Shrubs and Climbers of the Gold Coast, Ashanti and the Northern Territories, by T. F. Chipp, B.Sc., F.L.S., Assistant Conservator of Forests, Gold Coast. London. Waterlow and Sons, Ltd., 1913. 8vo. pp. 59.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 7.] [1913.

XLI.—THE IMPERIAL BOTANIC GARDEN OF PETER THE GREAT AT ST. PETERSBURG.

(With Plates.)

O. Stapf.

On June 24th, the bicentenary of the Imperial Botanic Garden of St. Petersburg was celebrated under the auspices of the Russian Government. The festivities, which were of a very solemn character, took place in one of the buildings in the Garden and were attended by the Princes Peter and Alexander of Oldenburg, Prince Gagarin as representative of Princess Eugenia of Oldenburg, the patroness of the Garden, the Ministers of Agriculture and Crown Domains, Commerce, Justice, Public Instruction and Marine, and other prominent officials and a large number of delegates from the Russian Academies, Universities, Botanic Gardens and similar institutions and from foreign countries. The Royal Botanic Gardens, Kew, and the Physic Garden, Chelsea, were represented by the writer of this article.

The meeting was preceded by a Te Deum, after which the Minister of Agriculture and Crown Domains opened the proceedings with a short address and the reading of a rescript from the Emperor by which the name of the Garden was changed into that of Imperial Botanic Garden of Peter the Great. Then followed an oration by the Director, Professor Fischer von Waldheim, dealing with the history and the functions, past and present, of the Garden, and the reading of the addresses, first of the foreign delegates and then of the representatives of the Russian learned societies and corporations and other bodies connected with botany. The address embodying the greetings and congratulations of Kew runs as follows :—

"On the Occasion of the Two Hundredth Anniversary of the foundation of the Imperial Botanic Garden, St. Petersburg, the Royal Botanic Gardens, Kew, beg to join with other Botanical Establishments throughout the world in the expression of warm congratulations and good wishes.

"The cordial relations which in the past have subsisted between the sister institutions have benefited both gardens and furthered the cause of that science to which the two are devoted. That these relations may be as distinctive of the future, that the services

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of the Imperial Garden to science may be as marked, and that its welfare and renown may be as great as in the past is the cordial wish of the Royal Botanic Gardens at Kew."

History of the Garden.

The Botanic Garden of St. Petersburg was founded by Peter the Great about 1713. The date usually given is the 11th February (old style) 1714, but Lipsky has been able to prove from documentary evidence that it was in existence at least as long ago as the 11th December (old style) 1713. There are therefore only ten years between the foundation of St. Petersburg itself and that of its Botanic Garden. If the laying out of the capital on the marshy banks and islands of the Neva was a bold and hazardous enterprise which only the genius and the iron will of the great ruler could carry out, the foundation of a garden on such ground was in its own way a no less bold experiment. The site selected for the garden was on one of the northern islands in the angle formed by the Greater Nevka and a small branch of the latter, the Karpowka. It was very low and consequently much exposed to floods. The primary object of the garden was the cultivation of medicinal plants for the army and navy. Hence its designation as Apothecaries' Garden and of the island on which it was situated as Apothecaries' Island, a name which is still in use. Subsequently the garden also served teaching purposes, and as its scope was widened, room was made for a more scientific treatment.

We possess a description of the garden by Peter von Haven, a Dane, who went to St. Petersburg in 1736. Speaking of Apothecaries' Island, which at that time was covered with a pretty spruce-wood through which avenues had been cut, the writer says, "The finest thing in the island is, however, the garden from which the island has its name . . . One finds there many kinds of plants and trees as occur in Europe and Asia, particularly in the greenhouse—so many, in fact, that Professor Siegesbeck, who is Director of the garden, assured me repeatedly that of all the gardens he had seen in other countries or from which he had catalogues, none was equal to it. At my time several hundred new species were introduced from China and Tartary, so that the Doctor was busy enough with giving them new names. The garden provides all the apothecaries with herbs, whence it is called Apothecaries' Garden. An apothecary resides always in the garden and it is his business to gather the herbs and prepare them. There are also plenty of fruit trees, as is evident from the fact that the rent of the fruit trees yields several hundred Reichs-Thaler per annum. However, it must be admitted that most of the fruit is neither so large nor so good as with us."

Of the men who directed the garden or were otherwise connected with it, it may be sufficient to mention J. C. Buxbaum, the traveller, J. G. Siegesbeck, known through his opposition to Linnæus, and J. P. Falk, the explorer of Russia and a pupil of Linnæus. The number of species cultivated in the Apothecaries' Garden does not seem to have at any time been very large. F. E. L. Fischer estimates it at 1300* at its highest. In the beginning of the last

* A "Catalogus plantanum horti Imperialis medici Petropolitani in Insula Apothecaria," published in 1796, contains 1456 species.

century its importance declined very much, and was quite overshadowed by the fame of Count Alexis Rasumowsky's garden at Gorenki, near Moscow. This garden owed its existence entirely to the enlightened taste and the generous liberality of its owner, and its dissolution after his death in 1822 appeared inevitable. In those circumstances the Emperor Alexander decided on the complete reorganisation of the old garden on Apothecaries' Island, and F. E. L. Fischer, who since 1804 had directed the garden at Gorenki with so much success, was entrusted with the work.

This was begun early in 1823, and proceeded with such rapidity that three years later the last of the glasshouses was completed. Their total length ran to about 1600 m.* and they cost over £19,000. At the same time a sum of £3178 was granted for the purchase of plants and the annual budget of the Garden was fixed at about £2200. In 1824 F. E. L. Fischer himself went abroad to visit the more important Gardens of Germany, France and England, returning with 3230† species of living plants. In England Fischer visited the Royal Gardens at Kew, the garden of the Horticultural Society, Chiswick, and the Botanic Gardens of Chelsea, Edinburgh, Glasgow, and Liverpool. In London alone the purchases amounted to about £1600, whilst the plants presented were estimated to have equalled if not exceeded that sum in value. Falderman, a gardener with the Royal Horticultural Society, was engaged as head gardener for St. Petersburg, and he and Goldie, another English gardener who had travelled in America, were entrusted with the task of taking the collection of treasures safely to St. Petersburg. By 1830 the number of species in cultivation had risen to over 12,000. At the same time the great library of the Gorenki garden and that of Dr. Stephan were taken over and an annual grant of £180 made for the maintenance of the library. Thus the foundation was laid for a botanical library which as to completeness has for a long time been unequalled and even now has but few rivals in the world. In a similar way provision was made for the establishment of a herbarium, the nucleus of which was formed by what was then left of Professor Stephan's Russian collections, by Riedel's Brazilian herbarium, and other sets. Fischer's own herbarium (containing about 60,000 species) remained his private property until his death, when it was purchased for the Botanic Gardens from his widow. F. E. L. Fischer's task was greatly facilitated by the wide connections he had formed whilst still at Gorenki. He counted among his personal friends Sir William Hooker, with whom he corresponded up to the end of his life.

The Apothecaries' Garden at the time of its reorganisation had its name altered to that of Imperial Botanic Garden, while it was at the same time transferred from the Medico-chirurgical Collegium to the Ministry of the Interior and, in 1830, to the Ministry of the

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* Fischer (in Flora, 1831, p. 99) says "750 Sarschinen oder 4130 englische Fuss." As a "sarschine" or "sasheen" is equal to 7 ft. (English), there must be some mistake in this statement. The conversion into metres was made from the dimensions as given in "sasheens."

† This is the figure given by Fischer himself in Verhandl. Verein. Beförd. Gartenb. in d. K. Preuss. Staat. 1844, p. 3 (reprint); *see also* English translation in Bot. Mag. vol. lxxi, at end, p. 26.

Imperial Household, where it remained until 1863. In 1830 the annual budget was £4250 and the size of the Garden not quite 22 hectares (about 54 acres).

Fischer retired in 1850 and was succeeded by C. A. Meyer, who since 1832 had been Assistant Director at the Imperial Botanic Garden. He died in 1855, when Eduard Regel, Chief Gardener in the establishment, was appointed Director. With him a new period in the history of the garden began. As already stated, the garden remained under the Ministry of the Imperial Household until 1863, and till then Regel acted as Director. When, however, it was decided to transfer the establishment to the Ministry of Crown lands, Trautvetter was entrusted with the administration of the Garden, and in 1866 took the title of Director of the Garden, Regel continuing to superintend the Herbarium and the cultures, and later on the cultures alone, as "Chief Botanist." In 1875 Trautvetter retired and Regel became again Director of the Garden, which was henceforth under his control until his death in 1892. It was during Trautvetter's interregnum, in 1869, that C. Maximowicz was appointed Chief Botanist, or Botanicus primarius in charge of the Herbarium, which post he held until his untimely death in 1890. These two men, however different in tastes, temperament and genius, have left their mark on the work and the position of the Petersburg Garden as it was up to nearly the end of the last century. It is not here the place to apportion their respective shares; but both Regel, the practical man, and Maximowicz, the scholar, found their opportunities mainly in the marvellous progress made in their day in the exploration of Central and Eastern Asia. In consideration of the geographical position of the Russian Empire and owing to the natural course of events, they wisely concentrated their efforts more and more upon that vast area extending from the Caspian to the Yellow Sea. In the Herbarium this made itself felt in the necessity of building up special collections, such as a Herbarium Rossicum, and a Herbarium Sibiricum, etc., by the side of the Herbarium Universale. In the garden an increasing number of Central and East Asiatic species were brought into cultivation, most of which found their way into European gardens, thanks to the liberality of Eduard Regel. The publications, moreover, which emanated directly and indirectly from the establishment have been devoted almost entirely to the floras of Russia and Central and Eastern Asia. Nowhere is this more evident than in the Acta Horti Petropolitani, founded by Trautvetter in 1870 and continued by Regel and his successors.

A 'Seminarium,' or depot for seeds, gathered in the Garden or received from travellers and explorers or by exchange, purchase or gift had been, it seems, a feature of the establishment from the earliest times. It continued to be a special department along with that of the 'Chancery' or Director's office, the 'Park' or Grounds, the Greenhouses, the Herbarium and the Library. To these departments in course of time were added a Museum containing carpological specimens, samples of woods, fossil plants and economically interesting objects, a biological laboratory, in 1868, and a seed control station, in 1870. To give

an idea of the size to which the collections had grown towards the end of Regel's directorship, it may be stated that the number of species and varieties in cultivation in 1892 is given as 27,030, that the annual accession to the Herbarium from 1872 to 1892 had on the average been 20,000, specimens, whilst the library had grown by the end of 1892 to 24,000 volumes. The budget for the Garden was fixed at £6330 in 1870 and, apart from extraordinary grants which became necessary from time to time, remained so under Regel.

Eduard Regel was succeeded by A. F. Batalin, who died four years later, and was himself succeeded in 1897 by Dr. Alexander Fischer von Waldheim, then Professor of Botany in the University of Warsaw.

The collections had long ago outgrown the accommodation provided for them, and the housing of the invaluable Herbarium and Library especially was dangerously inadequate. The existing laboratories were cramped for want of space ; moreover, new branches of the science of botany claimed admission into the organisation represented by the Imperial Botanic Garden, with the greater force, in that as their practical value was immediately and therefore doubly obvious. The time had come for new buildings and the general reorganisation of the establishment. The erection of a new palm house and a Victoria regia house had already been decided on in 1896. They were completed in 1899 at a cost of over £19,000. Then in 1900 the annual grant of the Botanic Garden was raised to £12,768. A phytopathological station was established in 1901 and gradually enlarged. On August 21, 1911, the foundation was laid for a new building for the Herbarium and the Library. It is now finished at a cost of £31,780 and is ready to receive the collections. A similar amount has been sanctioned for the erection of a new building for the Museum, and it is contemplated that the work will be begun next year. The other departments of the Garden have each claimed and received a similar attention, and those, who like the writer, have had an opportunity of comparing the state of the establishment as it presents itself to-day with what it was 20 years ago will not fail to appreciate the great progress which has been made during that period in almost every direction.

Organisation of the Garden.

The wide range of the work with which the Imperial Botanic Garden of Peter the Great is charged is thus defined in the official French guide issued on the occasion of the bicentenary :—The garden is intended principally for the study of the plants which compose the flora of Russia and the adjoining Asiatic countries ; for the study of vegetable products ; for research in plant anatomy and physiology ; for the study of plant parasites and the means of combating them ; for seed control ; for the study of the properties and the cultivation of plants which may be of practical importance for agriculture, horticulture, industries or medicine ; and, finally, for the popularisation of the botanical sciences.

This work is divided among the following departments : (1) the park or the grounds, (2) the glasshouses, (3) the herbarium,

(4) the museum, (5) the library, (6) the biological station, (7) the seed control station, (8) the phytopathological station, (9) the seminarium, (10) the chancery or director's office, (11) a school for gardening.

The Director is assisted by a scientific staff, consisting of three chief botanists, one chief conservator, five conservators, two assistant conservators and a librarian; by the staff of the 'chancery,' which includes one secretary and accountant, one cashier, one "intendant," one clerk and two assistant clerks; and, finally, by two head gardeners and two garden assistants. There are further employed 35 skilled gardeners, about 50 "fixed" labourers of both sexes, and about as many artisans, guards, porters and inferior hands. The Garden has also its own electric station, superintended by an electrical engineer. The impending completion of the reorganisation of the Garden will naturally necessitate a considerable increase of the staff and of the annual grant, which it is expected will reach a total of between £17,000 and £18,000.

The glasshouses are open to the public throughout the year, the grounds at all seasons with the exception of the winter, and the herbarium, museum and library on days and at hours fixed by the administration.

The Park.—The situation of the Garden has already been described. Its total area is about 22 hectares (54 acres), 12 hectares (not quite 30 acres) of which form the Park. This 'Park' is mainly laid out as an arboretum, with a parterre in the centre for the reception in summer-time of flowering plants from the glasshouses, and a belt of rockwork, rather over elevated, principally for the display of plants from Asiatic Russia and the adjoining countries, the plants being grouped geographically. There are also beds with representatives of the principal natural families of certain biological types and of economically interesting plants, on the whole pleasantly worked into the landscape. Very prettily laid out are some groups along a sluggish watercourse, more or less overshadowed by trees, and given up partly to a collection of plants characteristic of the flora of St. Petersburg and partly to systematic groups, including a large number of hygrophilous or aquatic and subaquatic plants. One can see that they feel at home and harmonise in their ecological requirements with the wood, towards the edge of which they are placed. If Peter von Haven's statement that Apothecaries' Island in his day was mostly covered with a spruce wood is correct, as it very likely may be, it is clear that very little of the original vegetation has been left in the Garden. Of conifers only the native species (spruce, common pine and larch), *Larix sibirica* and *L. dahurica* (*see* plate), and *Thuya occidentalis* seem to thrive well. The prevalent trees of the Arboretum are deciduous, as for instance limes (mostly *Tilia cordata*, or as they are labelled *T. ulmifolia*), poplars, birches, elms, willows, maples (*Acer platanoides*), bird-cherries, mountain ashes, &c. The ground underneath the trees is covered with a fairly luxuriant herbaceous vegetation, which in the small clearings forms typical northern meadows. Avenues are cut through the wood, and shrubs have been planted alongside and in other open places, some of which are doing exceedingly well, as for

LARIX SIBIRICA AND L. DAHURICA.

[*To face page* 248.

OSMUNDA REGALIS.

To face page 249.]

instance *Rubus nuthaensis*, *Cornus alba*, *Lonicera tatarica*, several species of *Crataegus* (particularly *C. sanguinea*) and *Cotoneaster*, *Spiraea sorbifolia*, *Caragana frutescens* &c.

No great variety or brilliant effect can be expected from a garden in the latitude of the Shetlands, where the snowdrop and the hazel do not begin to flower until towards the last week of April or even the beginning of May and frosts set in usually in the first week in October. Yet the aspect of the Garden and especially of the wooded portion with its rich young green is very pleasant indeed in the long days of the early summer and evidently much appreciated by the public which crowd there on Sundays.

The number of perennials grown in the grounds was given in 1912 at 4946 species and varieties, and those of the annuals at 1576.

The Glasshouses.—The disposition of the glasshouses is still according to F. E. L. Fischer's plan of 1824. They are arranged along the sides of a square about 200 m. by 150 m. A cross range parallel to the longer sides divides the square into nearly equal halves, whilst two smaller ranges project into the southern court. The large new Palm house and the pretty Victoria regia house jut out from the south side; the total length of the glasshouses amounts to over 1 km. and the space covered by them to 3 hectares (7·4 acres). The collection of plants contained in them is extremly rich, comprising over 19,000 species and varieties. The Palm house and the Victoria regia house as well as all the greater part of the other houses are iron structures with single glazing. The problem of keeping a thermophilous vegetation not only alive but flourishing in a climate with six months of winter and much reduced daylight is certainly one of very great difficulty; but a visit to the Fern, Aroid, Cycad or Palm houses shows that the difficulties have been overcome in a surprising way, mostly it seems, by keeping the temperature during the winter as low as the plants will stand it—for instance at 2·5-5° C. in the great Fern house, 5-7·5° C. in the Rhododendron house, which also contains Cacti and succulent Euphorbias—and thus reducing the vital processes to a minimum during the critical period.

Long ago attempts had been made to introduce landscape gardening into the larger houses. Cohn, more than 50 years ago, has spoken in enthusiastic terms of the effects thus obtained and they deserve, indeed, no less praise to-day. In the summer, when so many of the less delicate plants are transferred to the "parterre" in the "Park," it may be difficult to form an idea as to the state of the houses during the greater part of the year, but the hot houses did not appear overcrowded, and the largest of them produced a striking effect owing to the freedom allowed to the plants which seemed to be perfectly at ease and able to display all their charms. The Fern (No. 2), Cycad (No. 17) and the Palms (No. 26) house may be singled out as particularly deserving of admiration. Among the ferns some splendid specimens of *Osmunda regalis* with a base as colossal as that of an old *Todea* may be mentioned, if only because one of them has been promised to Kew (*see* plate). They were obtained from Sotshi (District of the Black Sea) in the Caucasus.

The Museum.—The museum is at present housed in a narrow building erected in the north court and along the central range of glasshouses. It comprises eleven rooms in which a small part of the very extensive collections is displayed in upright and table show cases. A considerable portion of one of the rooms is given up to the illustration of the desert flora of Turkestan which moreover, like that of Kamtschatka, is represented by a large number of excellent photographs, many being in the form of transparencies hung against the windows. The publication of a selection of these photographs would, no doubt, be welcomed by many botanists. Quite unique are a priceless collection of Ginseng roots, and a very effective exhibition of sand-dried flowers.

The erection of the new museum building will afford the much needed opportunity for the adequate display of the treasures which are at present still hidden away in cases and cabinets. The extent of the museum collections may be grasped from the figures given in the French guide book of the Garden, namely 8400 specimens for the dendrological, 29,400 for the carpological, 2800 for the paleontological and 7400 for the economic collection.

Biological Laboratory.—This adjoins the museum and is principally destined for the study of purely scientific or practical questions relating to plant life. Lately the work done there has been particularly concerned with problems connected with chlorophyll.

Herbarium.—This is, as already stated, one of the most important departments of the establishment. As it will fortunately be moved very soon into the new building, it is not worth while to dwell on the conditions of its present home.

The new building stands in the south-west corner of the gardens, about 200 m. from the glasshouses and the centre of the Park. It is a large building of four stories with an unpretentious elevation. The ground plan occupies an area about 85 m. long and 22·5 m. deep in the centre and 16 m. in each of the two wings. The construction throughout is fireproof. The central block contains the main staircase, lavatories and a lift, then on the ground floor, the vestibule and an inquiry office, and on each of the other floors a large general working room (15·3 m. × 6·8 m.). The wings are intended for the library (ground floor) and the herbarium (the other three floors). There are two office rooms for the scientific staff on each wing and on each floor. The eight large rooms in which the collections will be housed receive their light through five windows each on the west and four windows each on the east side. The floor space available for collections amounts to about 2400 m. (900 m. for books and 1800 m. for herbarium). The cabinets for the reception of the herbarium will be placed in double blocks between the windows and at right angles to them, and along the transverse walls. Room is marked out for 178 cabinets on the first and 292 on the third and fourth floors or 470 cabinets altogether. The cabinets are made of pinewood with birch wood veneering, each holding 60 shelves. The total number of shelves proposed is therefore 28,200. They are of two sizes, according to the two sizes of paper used for mounting. The collection is estimated to contain 90,000 species in 2,500,000 specimens. It is divided into 10 separate herbaria: (1) a general herbarium of Phanerogams and vascular Cryptogams; (2) a general

herbarium of lower Cryptogams ; (3) a Chino-Japanese herbarium ; (4) a Russian herbarium ; (5) a herbarium of Turkestan ; (6) a Siberian herbarium ; (7) a herbarium of the flora of St. Petersburg ; (8) a herbarium for teaching purposes ; (9) an Arctic herbarium ; (10) a collection of useful plants.

An ample supply of incandescent lamps provides for the illumination of the herbarium, while the heating is effected by hot water pipes. The scientific work undertaken at the herbarium will also in the future be mainly concerned with the floras of Russia and the adjacent countries. The collections are available for study by visitors on week days from 11 to 3 o'clock.

Library.—The library has until now been lodged in the same building as the herbarium, but before long it will be moved into the new herbarium building. It numbers at present 17,000 works in over 38,000 volumes. The books are kept in glass cases which are locked. There are three catalogues in use (1) a chronological catalogue in 6 volumes ; (2) an alphabetical card catalogue and (3) a subject catalogue (printed). For administrative purposes the library and the herbarium form separate departments under the control of the Director. Visitors have access to the library on weekdays from 10 to 3 o'clock, excepting Saturdays (in the summer).

Seed Control Station.—This is in the same building as the museum and it also has its own staff and special equipment. It possesses a mycological collection, a collection of diseased or otherwise injured plants, spraying appliances and other similar instruments for the destruction of parasitic organisms. The station is devoted primarily to research work, but also supplies gratis information concerning plant diseases and mycology generally.

Seminarium.—The functions of this department have already been explained on p. 246. It is at present lodged in the herbarium building.

School of Horticulture.—This is an elementary school attached to the Garden and under the control of the Director, but maintained by the Society for the Protection of Poor and Sick Children of St. Petersburg and is subsidised by the Government. It occupies a special building and has its own fruit and vegetable garden.

It only remains to add a few words concerning the official publications emanating from the Imperial Botanic Garden. The principal journal, "Acta Horti Petropolitani," has already been mentioned. It has run to more than 30 volumes, with about 18,000 pages. To this was added in 1901 the "Bulletin du Jardin Impérial Botanique de St. Petersbourg," and in 1902 the "Journal traitant les moyens de combattre les maladies et les lésions des plantes cultivées et des plantes sauvages utiles," which in 1907 was superseded by another journal under the title "Les maladies des plantes," and finally in 1912 the "Annales de la station d'éssais de semences." The annual seed lists (Index—now "Delectus"—Seminum quas Hortus Botanicus Imperialis Petropolitanus pro mutua commutatione offert), which were started by F. E. L. Fischer in 1835 and the earlier issues of which contain descriptions of many new species, have been continued so far without a break.

The bicentenary of the Imperial Botanic Garden of St. Petersburg has called forth the publication of a great memoir on the history (from 1713 to 1913) and the organisation of the Garden. So far, one volume, "Historical Sketch of the Imperial Botanic Garden of S. Petersburg (1713–1913)," by V. I. Lipsky, has been published, a quarto of 412 pages with 54 illustrations, mostly views from the Garden and in the houses. Not less than 297 pages are given up to the early history of the Garden (1713–1823), so much of which has hitherto been obscure.

Like most modern scientific works published in Russia, the memoir is written in Russian, as is the bulk of the more recent publications that have emanated from the great Garden at St. Petersburg, although some of them are accompanied by summaries in German or French. In so far as botany is concerned, a great change has come about during the last two decades in the use of Russian by Russian writers. Before then German, and to a smaller extent Latin and French, were the recognised vehicles for the communication of the results of botanical research work achieved by Russians in Russia. The history of the development of science in Russia is sufficient to explain that fact. To-day Russian science is rooted in the Russian people, and it has begun to speak almost exclusively in its own native tongue. Those who wish to see science internationalised—and in the end science is of all countries and not of any particular one—may sigh at the new burden which is laid on their shoulders by the upgrowth of a rapidly increasing literature written in a language which, beautiful as it may be, is really very difficult. Latin as a means of intercommunication is—apart from technical descriptions—practically dead and artificial languages are as remote as ever from practical application. There is indeed for the coming generation no way out of the dilemma save to recognise the process as a perfectly natural, legitimate and inevitable one and to add to its equipment a knowledge of a language which has already given much and promises to give still more. This was perhaps the lesson which impressed itself most on the writer during the days when the Botanic Garden on the Neva celebrated its bicentenary amid the acclamations of an assemblage as enthusiastic as it was representative of all that is connected with botany throughout the great Russian Empire.

XLII.—NOTES ON QUEENSLAND FLORIDEAE.

A. D. Cotton.

Mr. F. Manson Bailey's "Comprehensive Catalogue of Queensland Plants," which has just appeared, forms a valuable addition to the botany of Australia. The catalogue is not limited, as is so often the case, to flowering plants and vascular cryptogams, but it includes lengthy lists of algae, lichens and fungi. Mr. Bailey's interest in the flora of the country in which he has spent so many years is well-known, and it is largely owing to his enthusiasm and energy that the more obscure groups of plants have been so

vigorously collected. In the census given by him, 3606 species out of a total of 7865 belong to the Cryptogamia, which is a large proportion for a new country.

With regard to the fungi and marine algae, though the foundations of the flora were worked out many years ago by Berkeley, Cooke, Sonder and others, further supplies of material collected by Mr. Bailey and his collaborators have been continuously forwarded to Kew during the last few years. These have been determined as fully and rapidly as circumstances permitted, and the names, many of which were listed at the time in the "Queensland Agricultural Journal," are now incorporated in the new catalogue.

Amongst the algae forwarded several were set aside to await better material, or as worthy of more detailed notice. The following observations are the outcome of the investigation of some of this material. No corrections are put forward, nor are any additions to the catalogue recorded, the notes being for the most part of morphological or geographical interest.

Ceratodictyon spongiosum, *Zanard.*

Ceratodictyon is one of the most interesting of those marine algae which live in symbiosis with a sponge. The genus was hitherto unrecorded from Australia, but is apparently not infrequent in tropical Queensland since several specimens collected by E. J. Banfield at Dunk Island were forwarded.

The symbiosis of the larger algae and sponges is not uncommon in the tropics, and the same phenomenon is met with on a smaller scale in the sponges of cooler regions. In the British Isles carpets of short filamentous algae are often seen to be in competition with the encrusting sponges which grow in caves and other dark recesses on the shore. In some cases accidental concrescence of the two organisms is noticeable, in others such association is more or less constant and intimate. A further and much more advanced state of union is met with in the sponge *Halichondria panicea*, which is at times completely invaded by a green filamentous alga. The external form of the sponge remains unchanged, but infected plants may be recognised by their green colour. In the tropical seaweed *Thamnoclonium Tissotii*, on the other hand, the alga is the dominant partner, the sponge growing symbiotically on the surface of a large foliaceous thallus (see later).

Ceratodictyon differs from all the above in that a change in form is probably induced through the commensal existence. The main segments of the thallus are composed of very slender multicellular branches, which are woven together to form a dense network, the interstices being filled up by the sponge, which also forms an investing coat around each segment. In this case both organisms are with little doubt materially modified in habit. Excellent figures of *Ceratodictyon* have recently been published by Okamura (Icones of Japanese Algae, vol. ii, no. 1, Plates 51 and 52).

Corallopsis Urvillei, *J. Ag.*

The tetraspores in the genus *Corallopsis* are little known and have apparently not been described for the present species. A fine specimen (Bailey No. 199) is remarkable in possessing cystocarps and at the same time an abundant crop of tetrasporangia. The latter are produced in special very short pedicellate lateral branches, and are oblong ($60 \times 25\mu$) and cruciately divided.

C. Urvillei appears to be confined in Australia to tropical waters. It is known from Cape York and Trinity Bay, and all the specimens recently forwarded are from Dunk Island.

Digenia simplex, *Ag.*

A southern extension can be recorded for this species, a specimen from Dunk Island collected by E. J. Banfield being received. In the southern hemisphere the plant appears to be more limited in its range than in the northern, as in the latter it spreads well up into temperate waters, being frequent in the Mediterranean and also on the coasts of Japan.

Amansia pumila, *J. Ag.*

Evidently a rare species. Collected at Cape York many years ago by Daemel, and admirably figured and described by Sonder, the plant does not appear to have since been recorded. A good supply of material was forwarded from Dunk Island, and this for the most part, like the original gathering, was entirely sterile. A few pieces however bore cystocarps. These are of large size, and are produced on the marginal teeth of the pinnae.

Vidalia fimbriata, *J. Ag.*

V. fimbriata is one of the less-known Queensland algae, though it was described by Dawson Turner as long ago as 1811, being collected by Robert Brown (*see* Hist. Fuc. iii, Tab. 170). The type is preserved at the British Museum, and with it Mr. Bailey's plants have been compared. They agree well in size and habit, but the majority have very much broader fronds, and it is probable that R. Brown's specimen represented a narrow form. The plant is not unlike *V. spiralis* (Lam.) J. Ag. of West Australia, but differs from that species in producing its tetraspores in the marginal teeth and not from the midrib of the lamina, and also in the arrangement of the cortical cells.

No specimens of the plant existed previously at Kew, hence it may be regarded as a rare species of limited range, though perhaps locally frequent in N. Queensland.

Dunk Island. E. J. Banfield, Oct. 1909.

Neurymenia fraxinifolia, *J. Ag.*

The single gathering received supplied cystocarps which were hitherto unknown. They are borne on the adventitious shoots which spring from the surface of the fronds, and are produced, like the stichidia, on both sides of the thallus. Whether the procarps are situated on the primary adventitious branch, or on the secondary "fruiting branchlets" whieh Falkenberg describes for the tetrasporangia, could not be ascertained.

The plant is known from various localities in the Indian Ocean and was collected by Harvey in West Australia, and during the "Challenger" Expedition at Cape York, but has not hitherto been met with elsewhere in the Australian Continent.

Dunk Island, E. J. Banfield, Feb. 1910.

Thamnoclonium Tissotii, *Weber.*

This species, which in common with others of the genus, grows symbiotically with a sponge, was described by Madame Weber van Bosse in 1910, having been collected at the Kei Islands during the "Siboga" Expedition. It was interesting to receive the same

plant from Queensland, in the tropical parts of which State it would appear to be frequent, since six gatherings were forwarded from Dunk Island. Madame Weber kindly confirmed the determination.

The general morphology and structure of the present plant is very different from that of *Ceratodictyon* described above. The thallus consists of large, flattened, foliaceous segments of parenchymatous structure. Both surfaces are completely clothed with a thin sponge, into which penetrate curious moniliform filaments given off from the outer layer of algal frond. The external appearance of the dual organism is that of old faded fronds, with varying outline, but on handling, the surface is found to be distinctly rough, and a section shows the sponge with numerous clusters of projecting spicules. The connection between the moniliform filaments and the sponge is doubtless close, but on the whole the commensalism is hardly so intimate as in *Ceratodictyon*. For further details see Weber, Ann. Jard. Bot. Buitenzorg sér. 2, Suppl. iii., pp. 587–594.

XLIII.—THE WALLICHIAN HERBARIUM.

When Dr. Nathaniel Wallich, Superintendent of the Hon. E. I. Company's Botanical Garden at Calcutta from 1817* to 1845, visited England on leave in 1828 he had entrusted to him the task of arranging for the distribution of the dried specimens of plants in the East India Company's Museum, collected under his own superintendence. In connection with this undertaking Wallich began to draw up a list of the species represented in the collection and distributed, or to be distributed, by him to various botanical institutions. The title of this list, which constitutes the well-known Wallichian Catalogue, cited as 'Wall. Cat.' or 'Wall. Cat. Lith.,' is as follows :—

"A numerical list of dried specimens of plants in the East India "Company's Museum, collected under the superintendence of "Dr. Wallich of the Company's Botanic Garden at Calcutta."

The purpose of the compilation cannot be better stated than it has been by Wallich himself on the opening page :—

"The principal object of the following list is to supercede the "necessity of writing the numerous copies of labels, which will be "required on the occasion of the distribution of the duplicates in "the Company's collection. For this purpose each specimen will "have a current number attached to it, besides separate ones in all "cases when two or more different habitats are assigned to the "plants ; so that, by comparing the number of the specimens with "those in the list, they will be readily identified, their exact locality

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* Dr. Wallich is usually stated to have held charge of the Calcutta Garden from 1815 onwards (Britten & Boulger Biogr. Ind., p. 176), and as a matter of fact he was placed in temporary charge of the Garden on 24th Feb., 1815. From this charge he was relieved on 20th April, 1816, and was not placed in permanent charge until the receipt in India of an order from the Court of Directors to this effect on 1st August, 1817. (Ann. Roy. Bot. Garden, Calcutta, vol. x., p. xxiii. footnote.)

"ascertained, and the discrimination of the different species com-
"prized occasionally under one name facilitated. The species will,
"as much as possible, be enumerated under their respective genera;
"but frequent exceptions to this rule must necessarily occur.
"Those which have been sent home in preceding years will be dis-
"tinguished by having the abbreviated word 'Herb.' affixed to
"them, together with the year in which they were received and
"deposited in the Company's museum.—London, 1st December,
"1828."

In the following year, as the subjoined explanation, which is given on folio 60 of the catalogue after No. 2153, shows, permission was accorded to distribute various other collections in addition to those collected by Dr. Wallich himself.

"Since the preceding sheets were printed the undermentioned
"herbaria have been added from the East India Company's
"Museum to the collection brought home by Dr. Wallich, princi-
"pally with a view to the distribution of their duplicates. They
"will be indicated in the manner noticed below.

"1. An herbarium collected chiefly in the Circars by the late
"Dr. Patrick Russel. Contains no duplicates.—Herb.
"Russel.

"2. An extensive herbarium from the peninsula of India,
"collected apparently by the late Drs. Klein and
"Heyne and by Dr. Röttler. Contains many dupli-
"cates.—Herb. Madras.

"3. A very extensive herbarium collected in various parts of
"Hindustan by the late Dr. F. Hamilton (formerly
"Buchanan). Contains not many duplicates.—Herb.
"Hamilt.

"4. A small herbarium of the late Dr. Roxburgh. Contains
"no duplicates.—Herb. Roxb.

"5. An herbarium collected by the late Mr. George Finlayson,
"surgeon and naturalist to the mission which was sent
"to Siam and Cochinchina by the Bengal Government
"in 1821. Contains some duplicates.—Herb. Finl.

"6. A most extensive herbarium collected in various parts of
"the peninsula of India by Mr. Assistant Surgeon
"Richard Wight, lately in charge of the botanical
"establishment at Madras. Contains a great number
"of duplicates.—Herb. Wight.

"7. Several collections forwarded by Dr. Wallich to the
"Company's Museum and containing a vast number of
"duplicates. They will be referred to in the manner
"heretofore adopted and pointed out in the first page
"of this list.

"December, 1829."

The preparation of the catalogue and the distribution of the herbarium proceeded rapidly, and had reached No. 2,603 in 1830, No. 4,877 in 1831, and No. 7,683 in 1832. It had not, however, been possible to complete the task when it was necessary for Dr. Wallich to return to India and resume charge of the Calcutta Garden. But, before he left, it had been arranged that the type set of the catalogued specimens and the unassorted residue be

transferred to the Linnean Society, and a letter from the Court of Directors of the Honourable East India Company addressed to Lord Stanley, then President of the Society, offering the Wallichian Collections as a free gift to the Society, was read at a meeting of the Society's Council on 23rd June, 1832. This offer the Council accepted, resolving thereupon to hold the herbarium as a trust for the general benefit of science, and drafting in reply to the letter an address which was taken by the President and as many members of Council as could attend, to the East India House, Leadenhall Street, on 26th June, 1832.

This letter and the address in reply were, by permission accorded to Dr. Wallich* on 7th August, 1832, printed in the postscript to the third and last volume of Wallich's *Plantae Asiaticae Rariores*, and are as follows :—

East India House, 19th June, 1832.

My Lord,

The Court of Directors of the East India Company have within the last four years caused to be distributed to various bodies in this country and in Europe, interested in the promotion of science, between 7,000 and 8,000 species of plants collected by celebrated naturalists in the Company's service, during a series of years, in India.

The objects being attained for which the originals of these specimens have been placed with Dr. Wallich in Frith Street, the Court of Directors feel that this Collection may not be an unacceptable addition to the Museum of the Linnean Society of London, which already possesses the herbarium of the celebrated Linneus. We have therefore the honour, at the instance of the Court of Directors, and in the name of the East India Company, to proffer, through Your Lordship, for the acceptance of the Linnean Society, the Collection in question ; and should the Council of the Society be pleased to give effect to the intentions of the Court, the necessary directions will be given to Dr. Wallich to transfer the Collection to the party who may be authorized by the Council to receive the same.

We have the honour to be,
My Lord,
Your Lordship's most obedient humble Servants,
(Signed) John G. Ravenshaw.
C. Marjoribanks.

To the Viscount Stanley, M.P.

The Council of the Linnean Society having had a letter laid before them by the President, addressed to his Lordship by the Chairman and Deputy Chairman of the Court of Directors of the East India Company, in which that Honourable Court have been

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* Wallich had previously been appointed member of a Committee of four, which included Robert Brown, Francis Booth, George Bentham, and himself, whose duty it was to superintend the arrangement of the herbarium and the provision of cabinets. The Court of Directors of the East India Company had further voted a sum of £200 for the purchase of paper upon which to mount the specimens.

pleased to offer for the acceptance of the Society the extensive Collectiou of dried plànts preserved in the Museum of the India House, take the earliest opportunity of expressing their high sense of the distinguished honour conferred upon the Society by this unexampled act of liberality.

The Council, in behalf of the Society, accept with feelings of profound gratitude the Collection thus proffered to them, and beg to assure the Court that it shall be held as a trust for the general benefit of science.

The Council cannot avoid expressing their admiration of the enlightened policy shown by the Honourable Court of Directors, with relation to their collections in natural history, in extending the advantage to be derived from them, by the most liberal distribution of specimens throughout the scientific world, and by this memorable instance of their munificence, in placing the fruits of the labours of König, Roxburgh, Rottler, Russell, Klein, Hamilton, Heyne, Wight, Finlayson and Wallich, along with those of the immortal Linneus.

The East India Company, by extending its patronage to those distinguished naturalists who have cultivated science in Asia, so much to their own honour and to the credit of the service to which they belonged, and by the general use of the rich materials in its possession, has deeply impressed the members of every learned institution throughout Europe and America with feelings of admiration and respect ; and the Council of the Linnean Society can only re-echo the voice of general acknowledgment for the great services which the Honourable Company has thus rendered to the cause of science.

An example of disinterestedness has been exhibited by the Company which has already reflected, and will continue to reflect, deserved honour upon them and upon the country, and which cannot fail to diffuse a spirit of emulation throughout the world.

London, June 23rd, 1832.

In October 1832 Dr. Wallich addressed letters to the Linnean Society, which were read in Council on 6th November, reporting that the remainder of his collections had been sent to the Society on 29th September and requesting the Council to transmit the best set obtainable to the garden at Calcutta.*

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* How far an effort was made by the Linnean Society to carry out Dr. Wallich's wishes is unknown ; we know that no specimens were sent by them to the Calcutta Garden. It is, however, interesting to find that this request was made and that Wallich, before his return to India in 1832, had already realised the consequences of the distribution "to various bodies in this country "and in Europe" of the "plants collected by celebrated naturalists in the "Company's service, during a series of years, in India" without arranging that "the best set obtainable" should be placed in the "Garden at Calcutta" at whose expense and on whose behalf the bulk of these collections had been brought together. It may be that when Wallich, in 1828, obtained the approval of the Court for the list of the institutions to which he proposed that sets of specimens should be given he did not contemplate the necessity of returning to India and that to this circumstance may be due the omission of the Calcutta Garden from the list of recipients of its own specimens. We know that when, in 1847, Wallich returned to Europe and had himself an opportunity of doing what was still possible to repair the injustice which had been committed he did not take that opportunity. It was left to Hooker and Thomson to do what Wallich had left undone (*K.B.*, 1912, p. 5).

In addition to £200 voted by the Court of Directors to pay for the paper on which the specimens were mounted, the sum of £80 was spent by the Linnean Society in glueing down the sheets and before the anniversary meeting of the Society on 23rd May 1833 £310 14*s*. had been spent on cabinets and other outgoings. Under this heading £5 more was spent subsequently.

At folio 254 of the Catalogue occurs the following note by Dr. Wallich :—

"I have been enabled to add the following two indexes through "the generous and valuable assistance I have received from my "highly esteemed friend Mr. Royle, late Superintendent of the "Botanic Garden at Saharunpore, to whom I take this opportunity "of returning my warmest thanks. This indefatigable and "admirable botanist has lately arrived in this country from India "with a magnificent harvest of dried plants, drawings and des-"criptions, a great proportion of which relate to the fruitful and "hitherto unexplored regions of Kunnower and Cashmere and will "be published by him without delay."

When Dr. Wallich retired from the service of the Hon. East India Company and returned to Europe he took up his abode in England and set about the completion of the list and of the distribution. The supplement which begins on folio 269 of the Catalogue opens as follows :—

"Numerical list of dried plants in the herbarium of the "Honourable East India Company presented to the Linnean "Society of London, continued from Dr. Wallich's List.

"Euphorbiaceae and other plants which on the first sorting were "mixed with them and have been roughly arranged in species for "the purpose of distribution."

This supplementary distribution was in active progress during 1847–49 and was completed by the end of the latter year. To a very great extent the accomplishment of this portion of his task was facilitated by the assistance which Wallich received from Bentham, acknowledged at folio 263 and again at folio 290 and 300, in the following terms :—

f. 283. "I have to state with grateful thanks to Mr. Bentham, "that without his continued, most obliging and valuable assistance, "at his residence here, I should have been unable to index and "prepare the remnant of the East Indian Herbarium for its final "distribution.—Pontrilas House, Hereford. 22nd Octob. 1847.—"N. Wallich."

f. 290. "I have again to return my grateful thanks to my "friend G. Bentham, Esq., for having enabled me to proceed with "the East Indian Herbarium.—Pontrilas House, Hereford. 5th "August, 1848.—N. Wallich."

f. 300. "Before leaving my friend Mr. Bentham and his noble "herbarium, I have again and lastly to express my most grateful "thanks to him for that distinguished assistance by which alone I "have been enabled to bring this catalogue to a conclusion.—Pontrilas "House, near Hereford. 10th September, 1849.—N. Wallich."

Dr. Otto Kuntze, who has made a careful study of the Catalogue issued by Wallich, as apart from the specimens with which the Catalogue deals, has given an account of the work in his *Revisio*

Generum Plantarum, vo 1., p. cxlv., which is so exhaustive that an English version may not be unsuitable here. It runs as follows :—

Wallich, N. A numerical list. According to Pritzel the date is 1821. This, however, is only the date of the title-page. The new genera established in it have been cited by Pfeiffer with inconsistent and often, with regard to the numbers, contradictory dates. I have drawn up a long list which, however, does not give me any trustworthy results. In Wallich's list, or catalogue, as it is usually cited, the following dates may be found :—Preface, December 1, 1828 ; after no. 2159, December 1829 ; after no. 4361, 1830 ; after no. 7683, 1832 ; later, in the supplement, nos. 7684–9148, after no. 8234 [8324], October 22, 1847, after no. 8622, August 5, 1848 and on folio 300, November [September] 10, 1849. Nos. 7684 to 9148 were therefore published in the years 1847–9. I was not clear as to the earlier numbers till I found in an unpublished dictionary by de Candolle the following valuable note :—Nos. 1–2153, 1829 ; nos. 2154–2603, 1830 ; nos. 2604–4877, 1831 ; nos. 6225–7683, 1832. Nos. 4878–6224 appear not to have been received by de Candolle ; they could, however, have appeared only between 1831 and 1832. In Wallich's Catalogue there are occasional later corrections and repetitions of earlier numbers which, with regard to the question of priority, scarcely need be considered. Judging from the occasional notes and acknowledgments by Wallich, he had the assistance or collaboration of R. Brown, Bentham, Lindley, Royle and Wight,* who in other works helped to introduce the many new names, though *nomina seminuda*, contained in the Catalogue, otherwise rejected by Bentham. This was also more frequently done at the expense of Don's Florae Nepalensis Prodromus, 1825, the author of which, dealing with the same flora, not rarely anticipated Wallich. The remainder of these *nomina seminuda*, so far as they have priority, must stand.

Before leaving the subject of this Catalogue it should be noted that in the Herbarium at Kew there is a manuscript commentary dealing with the localities cited by Wallich for certain of his numbers. This commentary, which is from the pen of the late Mr. C. B. Clarke, is of considerable value, and it may serve a useful purpose if it be reproduced here for the benefit of those other institutions that possess sets of the Wallichian specimens.

Notes on the "Khasia" localities of Wallich's List.

The frontier of Sylhet was, at the date of F. De Silva's collections, just north of Pundua where it is now. Pundua was then as now the "Gate" of the Hills, the main-road ascending 4000 feet from Theria north of it. At this date there were English officers and troops at Nungklao, who went up from the north valley (Goalpara) ; but none at Cherra Poonjee.

'Khasia' was subsequently part of Zilla Sylhet, and (down to 1868) under the Judge of Sylhet, and was called North Sylhet. The locality 'North Sylhet' occurs frequently in the collections of Griffith, &c., but not (so far as I recollect) in Wallich's ; it was a name later than Wallich's time.

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* Dr. Kuntze might have added particularly the name of Graham, Professor of Botany, Edinburgh, who assisted Wallich in dealing with the Leguminosae.

At Sylhet Station, 16 miles S.E. of Pundua, there are teelas, isolated hills 100 feet high, and considerable tracts of jungle between and round them. This is very fine collecting ground; here grow many orchids and figs, and *Asplenium longissimum*, which Wallich marks "Sillet." Under n. 2278 Wallich writes "Sillet De S.," "? B. Mont. Sillet, F. De Silva." From this it is clear, as from many other entries, that Wallich distinguished between 'Sillet,' *i.e.*, the old (and present) Zilla, and the 'Mont. Sillet' or 'Mont. Sillet vicinae,' by which he indicated Khasia.

There are, however, a large number of plants marked by Wallich 'Sillet' only, which in all probability came from Khasia. This is especially the case in the first numbers 0–2160; afterwards Wallich was more careful. In the case of common, or widespread, plants Wallich seems (even later) not to have troubled to write more than 'Sillet.'

Pundua is the farthest point north to which F. De Silva's boat would go. He collected, from his boat, along the rich Terai (0–2000 feet alt.) along the southern face of the hills; and he appears to have ticketed such collections simply 'Pundua.' Many of the plants thus ticketed 'Pundua' were (from our present knowledge of their distribution) collected at 2–6000 alt. and some way into the hills. F. De Silva may have made 2 or 3 days excursions from his boat, or may have employed Khasis to collect.

The only point to note here is that all the collections marked 'Pundua' came (certainly to me) from Khasia—no collector at Pundua would attempt collecting southward thence in the swamps—all the 'Pundua' plants came from the hills.

None of the plants marked 'Sillet' can be safely or profitably assigned to Khasia *on Wallich's authority*. Many we may strongly suspect to be Khasi, on abundant other evidence; it is in all these cases useless to cite Wallich (*i.e.*, for the locality Khasia) because his examples ticketed 'Sillet' adds nothing to our evidence, *i.e.*, as to Khasi localities; it only proves that the plant was collected *either* in Sylhet *or* in Khasia.

Any 'Khasi' localities taken from Wallich's List should include all the plants marked 'Pundua,' 'Montes Sillet' and none of those marked 'Sillet.'

On some of Wallich's sheets, the name Sillet has by some hand been ruled out and Singapore foisted in; as in the case of *Asplenium longissimum* and some other species belonging to the teelas at Sylhet Station.

C. B. Clarke.

25 August, 1896.

The Wallichian Herbarium itself was transferred in 1857 from Soho Square to Burlington House. In 1863 the Wallichian Collection was specifically exempted from the regulations under which the miscellaneous collections of the Linnean Society were disposed of and in 1873 the Herbarium was moved into the apartments at present occupied by the Society.

When in 1872 the preparation of the *Flora of British India* was undertaken by Sir J. D. Hooker the Society's Council, on 1st February, gave permission that such specimens in the Wallichian

Herbarium as might be required during the progress of the *Flora* for comparison with those in the Herbarium at Kew, be allowed to be borrowed from time to time as required.

About 1881 the desirability of re-arranging the Wallichian Herbarium in numerical order came up for discussion and on 16 June, 1881 a committee was appointed to carry out the suggested re-arrangement. During the autumn recess the task was accomplished by the late C. B. Clarke, and the Committee of which he was the most active member submitted a report on the collection in which certain gaps in the sequence were pointed out. In 1886 a circular was sent to the chief European herbaria, requesting that the missing numbers specified might be returned. Some of these missing numbers have, as a result, been replaced.

In 1904 urgent demands upon the space at the disposal of the Society in its apartments led to the removal of the Cabinets from the Council chamber upstairs to the old Post office, where they were set up afresh. The opportunity was taken to repolish the Cabinets; the cost of this and of their removal amounted to £49 16*s*.

More recently the same demand for space has led the Society to desire that the Wallichian collection might find another home. The difficulty that has stood in the way of the realisation of this desire has been in connection with the considerable expenditure incurred by the Society from first to last in connection with the Cabinets in which the specimens are preserved.

Thanks to the munificent generosity of one of its Fellows* the Society has been placed in the position of being able to carry out what for a considerable time has been known to be the general wish, and the General Secretary of the Society was instructed to write as follows to the Director of Kew :—

Burlington House, Piccadilly, W.
April 4, 1913.

At a Special General Meeting of this Society held yesterday, 3rd current, the following motion was adopted by the Fellows :—

> That the Wallichian Herbarium and later additions from Dr. Horsfield and others be offered to the Royal Botanic Gardens, Kew.

The Council further stipulate that all expenses connected with the removal and transference of the said collections are to be borne by the beneficiary.

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* In connection with this generous act the General Secretary of the Linnean Society has at the request of the Director of Kew supplied the following explanation which deserves permanent record here :—"Burlington House, "25th July, 1913. With reference to the Wallichian Herbarium transferred to "your keeping by consent of the Society in General Meeting assembled, on the "3rd April, 1913, that resolution only concerned the collection of dried plants "with additions from Horsfield and others.

"The mahogany faced cabinets were transferred to Kew in consequence of "the generous gift by Sir Frank Crisp, Bart., of the sum at which they were "valued by the Council, and this gift enabled the Council to submit their "resolutions to the Society as stated."

I am therefore to ask whether you will accept these collections on the terms stated and in any case an answer which can be laid before the Council on the 17th instant will be esteemed.

The reply to this letter was as follows :—

Royal Botanic Gardens, Kew.
April 5, 1913.

I HAVE the honour to acknowledge receipt of your letter dated 4 April conveying the text of a motion relative to the Wallichian Herbarium now the property of the Linnean Society which the Council of the Society had been so kind as to formulate and the Fellows in Special General Meeting assembled have been so generous as to adopt.

In reply I beg to inform you that I shall be glad to accept the collections referred to in the motion under the conditions which the Council have attached to the donation.

The transfer of the Herbarium to Kew in accordance with the arrangement detailed above took place on July 11th, 1913.

XLIV.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECAS LXXIV.

731. **Rosa (Cinnamomeae) persetosa**, *Rolfe* [Rosaceae] ; affinis *R. aciculari*, Lindl., sed floribus minoribus in paniculas laxas dispositis differt.

Frutex erectus, ramosus. *Caules paniculisque* longe et dense setosi. *Folia* 8–11 cm. longa ; rhachis gracilis, puberula, sparse glandulosa et aculeis paucis gracilibus instructa. *Foliola* 5–9, elliptica vel elliptico-ovata, serrulato-dentata, 1·5–4 cm. longa, 1·2–5 cm. lata, supra glabra, subtus puberula. *Stipulae* adnatae, linearioblongae, acutae, minute pectinatae, 1–1·7 cm. longae. *Paniculae* terminales, 9–12 cm. longae, copiose setosae. *Bracteae* lanceolatae, acuminatae, 1–2 cm. longae. *Pedicelli* graciles, glabri. *Cupula* oblonga, 5–6 mm. longa, glabra. *Sepala* 2–2·5 cm. longa, basi ovato-oblonga, medio angusta, apice lanceolata, minutissime puberula et ciliata. *Corolla* 2·5 cm. lata, saturate rosea ; petala 1·3–1·5 cm. lata. *Stamina* 3–4 cm. longa ; antherae 2 mm. longae. *Styli* 2·5 mm. exserti.—*R. macrophylla? forma gracilis*, Vilmorin, Fructic. Vilmorin (1904) 94.

CHINA.

Flowered with Messrs. Paul & Son, The Old Nurseries, Cheshunt, in June, 1912. In its strongly setose character the species recalls *R. acicularis*, Lindl., but it differs from this and every other member of the *Cinnamomeae* in its lax, many-flowered panicles, which give the plant a very graceful appearance. The flowers are also rather small, and the sepals relatively long, being

about twice as long as the petals. Messrs. Paul received this rose from Messrs. Vilmorin, Paris, and from a dried specimen afterwards received from the latter firm it appears that they obtained it from China some years ago with the seed number 711, and that it flowered with them in June, 1903. It has recently been received from Mr. M. Nicholls, Sevenoaks, with the number, Wilson, 4418, showing that it has since been collected by Mr. E. H. Wilson during his recent mission to China.

5-780 732. **Deutzia compacta**, *Craib* [Saxifragaceae-Hydrangeae]; species a *D. rubente*, Rehder, inflorescentia compacta multiflora, floribus minoribus distinguenda.

Ramuli primo pilis stellatis scabridi, mox glabri, cortice brunneo vel rubro-brunneo obtecti. *Folia* lanceolata vel oblongo-lanceolata, apice acute acuminata, basi rotundata vel cuneato-rotundata, 1·7–5 cm. longa, 0·8–1·9 cm. lata, pagina utraque pilis stellatis albis parce instructa, nervis lateralibus utrinque 5–7 intra marginem anastomosantibus supra impressis subtus prominentibus, nervis transversis paucis supra impressis subtus prominulis, petiolo 3–4 mm. longo supra canaliculato suffulta, margine argute serrulata. *Inflorescentiae* corymbiformes, multiflorae, ramulos laterales ad 10 cm. longos basi bracteatos terminantes; pedunculi communes ad 1·5 cm. longi, partiales circiter 5 mm. longi; pedicelli ad 3 mm. longi; alabastra obovoidea, alba, superne leviter puniceo-suffusa, bracteis bracteolisque minutis. *Receptaculum* viride, late campanulatum, 1·5 mm. altum, fere 2 mm. diametro, ut sepala pilis parvis stellatis tectum. *Sepala* vix 1·5 mm. longa, obtusa vel breviter obtuse acuminata, ciliolata. *Petala* imbricata, subrotundata, 4 mm. diametro, alba vel dorso superne leviter puniceo-suffusa. *Stamina* petalis valde breviora; exteriorum filamenta denticulata, dentibus antheras haud attingentibus, interiorum filamenta iis exteriorum valde breviora, dentibus antheras superantibus. *Styli* glabri, stamina interiora subaequantes.

China.

Cultivated at Kew and at Glasnevin; plants originally received from Messrs. Vilmorin.

733. **Lonicera Robertsonii**, *Gamble* [Caprifoliaceae-Lonicereae]; species *L. obscurae*, Coll. et Hemsl., et *L. Bournei*, Hemsl., affinis, foliis ovato-cordatis infra pubescentibus, floribus brevioribus corollae tubo pubescente differt.

Frutex scandens (?), pubescens; ramuli graciles, fulvo-velutini. *Folia* ovata, apice obtusa vel obtuse acuta, basi cordata, in ramulis ultimis 3–6 cm. longa, 2–4 cm. lata (forsan in vetustioribus majora), chartacea, supra praeter costam glabra, nitida, infra fulvo-pubescentia et minute glandulosa, costa gracili supra pubescente, nervis lateralibus utrinque 4–5 curvatis, reticulatione conspicua, integra; petiolus gracilis, vix 3–4 mm. longus, pubescens. *Flores* geminati, in fasciculis axillaribus subsessilibus vel breviter pedunculatis; bracteae subulatae, 2 mm. longae, hirsutae; bracteolae ovatae, vix 1 mm. longae. *Receptaculum* ovoideum, 2 mm. longum, glabrum. *Sepala* triangularia, acuta, 1–2 mm. longa, pubescentia. *Corollae* tubus gracilis, cylindricus, 3–4 cm. longus, extra pubescens; lobi 5, quorum 4 ovati, fere acuti, quintus oblongus, longior. *Antherae* oblongae, obtusae, haud exsertae. *Stylus* filiformis,

inferne glaber, superne hispidus, paullo exsertus ; stigma capitatum, subbilobum. *Fructus* adhuc ignotus.

INDO-CHINA. Upper Burma : Southern Shan States, near Ohgyi, Bawlake, in dry rocky country with pine forest, 1200 m., *W. A. Robertson* 142.

734. **Bragantia affinis**, *Planch. Mss. ex Rolfe* [Aristolochiaceae] ; a *B. tomentosa*, Blume, foliis angustioribus basi cuneatis vel subrotundatis et triplinervis facile distinguenda.

Ramuli angulati, cinereo-tomentosi. *Folia* petiolata, oblonga vel anguste elliptico-oblonga, obtusa, basi cuneata vel subrotundata, triplinervia, supra glabra, subtus crebre reticulato-venosa, arachnoideo-pubescentia, pilis adpressis, 15–20 cm. longa, 4·5–7 cm. lata ; petioli 0·6–1·5 cm. longi, pubescentes. *Pedunculi* ex infera caulis parte producti, simplices vel pauce ramosi, 6–10 cm. longi, cymosi, cinereo-pubescentes. *Bracteae* oblongae vel elliptico-oblongae, subobtusae, pubescentes. *Flores* pedicellati. *Pedicelli* 0·8–1·5 cm. longi. *Perianthium* basi ovario adnatum, lineare, stipitiforme, supra ovarium articulatum, late campanulatum, trifidum, extus pubescens ; lobi rotundato-ovati, subobtusi, subaequales, 5 mm. longi, fauce aperta, annulata. *Stamina* 6 ; antherae oblongae, 1·5 mm. longae ; filamenta brevissima. *Stylus* 2·5 mm. longus, trifidus. *Capsulae* lineares vel subfusiformes, acuminatae, moniliformes, circiter 5 cm. longae. *Semina* oblonga vel obovoideo-oblonga, subcompressa, tuberculata, 4 mm. longa.

PHILIPPINE ISLANDS. Island of Panay, *Cuming* 1689. Dumarao, Panay, *E. D. Merrill* 6700. Luzon, prov. of Tayabas, at Tagcauayan, *Ramos* (Bur. Sc. 13,370).

This species, first collected by Cuming, was named by Planchon, but apparently never published. It has been again collected in the island of Panay by Mr. Elmer D. Merrill, and also in Luzon by Ramos, the specimens from the latter locality having rather broader leaves.

735. **Actinodaphne Henryi**, *Gamble* [Lauraceae-Litseae] ; species florum umbellulis in racemos sericeos circa 2–2·5 cm. longos collectis et foliis magnis conspicue nervosis insignis.

Arbor 9 m. alta ; ramuli crassi, griseo-puberuli ; gemmae elongatae, perulis obtusis sericeis, inferioribus margine glabris. *Folia* coriacea, 4–5 in verticillis ad apices ramulorum, lanceolata, apice acuminata, basi attenuata, 30–40 cm. longa, 7–13 cm. lata, supra glabra, subtus glauca, secus costam et nervos molliter pubescentia, costa crassa subtus conspicua, nervis utrinque 10–12 conspicuis obliquis prope marginem gradatim arcuatis, imis fere marginalibus, nervulis minimis parallelis junctis ; petiolus crassus, 4–5 cm. longus. *Flores* ♂ ignoti ; ♀ florum umbellulae in racemos axillares 2–2·5 cm. longos eximie albo-sericeos basi bracteis obovatis sericeis circa 1 cm. longis suffultos collectae ; pedunculi circa 3 mm. longi ; bracteae involucrales cito caducae ; flores in umbellulis circa 5 ; pedicelli sericei, 2–3 mm. longi. *Perianthii* tubus campanulatus, extra et intus sericeus, 2 mm. longus ; lobi intus glabri, obtusi, trinervii. *Staminodia* 9, ordinis I et II clavata, 1·5 mm. longa, ordinis III minora, glandulis 2 orbicularibus munita. *Ovarium* ovoideum, glabrum, stylo gracili geniculato, stigmate magno capitato papilloso. *Fructus* ignotus.

CHINA. Yunnan : Szemao, 1200 m., *A. Henry* 11,799A.

736. **Lilium (Martagon) Thayerae,** *Wilson* [Liliaceae-Tulipeae]; species ex affinitate *L. sutchuenensis*, Franch., a qua caule rigido dense brevissimeque hispidulo in axillis foliorum conspicue albo-barbato, foliis lineari-oblongis marginibus revolutis scabridis, floribus in racemum laxum pyramidalem dispositis, alabastris villosis differt.

Bulbus late ovoideus, 2·5–6 cm. diametro; squamae ovatae vel lanceolato-ovatae, acutae, albae, saepe roseo-tinctae. *Caulis* erectus, 0·5–1·5 m. altus, rigidus, dense brevissime albo-hispidulus, usque ad 15–20 cm. sub flore infimo folia numerosissima densa erecto-patentia gerens, in axillis foliorum pilis albis floccosis barbatus. *Folia* anguste lineari-oblonga, apice acuminata, decurva, 8–12 cm. longa, 3–4 mm. lata, pagina utraque puberula, punctisque lucentibus obsita, prominenter uninervia, supra canaliculata, costa subtus scabrida prominenter carinata, margine recurvo minute denticulato scabridoque. *Racemi* pyramidales, laxi, 1–20 (vel ultra)-flori; pedicelli rigidi, robusti, 8–15 cm. longi, erecto-patentes vel horizontales; bracteolae solitariae (rarius duae), folio similes, patulae; alabastra cernua, praesertim statu juvenili dense villosa. *Perianthium* mediocre, saturate coccineum; segmenta reflexa, oblonga vel oblongo-lanceolata, apice obtusa, 7–8 cm. longa, 1·5–2 cm. lata, praesertim a medio basin versus atro-maculata, maculis rarius sparsis vel omnino deficientibus, apice villosa, interiora inferne papillis carnosis hic illic instructa, dorso valde carinata; sulci nectariferi segmentorum interiorum apices attingentes, latere utroque carina inferne usque ad trientem albo-villosa ceterum glabra adjuncta. *Stamina* pistillo breviora; filamenta subulata, inferne complanata, circiter 5 cm. longa, triente superiore extrorsum curvato, aurantiaco-tincta, glabra; antherae oblongae, 2-2·5 cm. longae, primo coccineae, maturescentes fuscescentes. *Ovarium* viride, demum aurantiaco-brunneum, cylindricum, sulcatum, circiter 2 cm. altum; stylus aurantiaco-tinctus, extrorsum curvatus, infra stigma sub-complanatum aurantiaco-brunneum tenuiter incrassatus. *Capsula* purpurea, subglobosa vel obovoidea, trigona, angulis laevibus, truncata, erecta, circiter 2·5 cm. alta, 2 cm. diametro.—*L. sutchuenense*, Franchet in Journ. de Bot., vol. vi., p. 318, quoad specimen a Prin. Henri d'Orleans lectum; Gard. Chron., ser. 3, vol. xxxviii., p. 91, cum tab.; Wilson in Flora and Silva, vol. iii., p. 330, t. fig. 2 and icon.; Grove, Lilies, p. 72, pro parte.

China. Western Szechuan: Tachienlu, *E. H. Wilson*.

This new species is named after Mrs. Bayard Thayer, Lancaster, Mass., a keen lover of horticulture and a generous friend of the Arnold Arboretum's exploration work in China.

737. **Lilium (Martagon) Willmottiae,** *Wilson* [Liliaceae-Tulipeae]; species a *L. Thayerae*, Wilson, caule debili pubescente, foliis lineari-lanceolatis trinerviis marginibus planis laevibus, floribus dense racemose dispositis, alabastris nutantibus glabris, sulco nectarifero segmentorum perianthii interiorum ad tertiam partem producto differt.

Bulbus late ovoideus, 2–7 cm. diametro, albus; squamae pro rata numerosae, ovato-lanceolatae, acutae. *Caulis* debilis, basi radicans, 0·75–2 m. altus, teres, gracilis, plus minusve dense rubro-purpureo-maculatus, puberulus. *Folia* congesta, etiam ea quae floribus proxima normalia, sed densiora brevioraque, patentia, lineari-lanceolata, acuta,

basi haud angustata, 5–16 cm. (plerumque 8–12 cm.) longa, 4–7 mm. lata, parte superiore decurva, supra viridia, nitida, canaliculata, costa pallide viridi prominula, subtus pallide viridia, costa prominente nervis lateralibus duobus subconspicuis; pagina utraque punctis lucidis conspersa, margine hyalino, basi in latere utroque pilis paucis floccosis instructa. *Racemi* densi, 3–25 (vel ultra)-flori ; rhachis nitida, cum pedicellis fusco-purpureo-maculata ; pedicelli uni- vel interdum bi-flori, horizontales, decurvi, 5–12 cm. longi, teretes ; bractea brevis, foliosa ; bracteolae 1 vel saepius 2, parvae, foliosae, patulae ; alabastra intense aurantiaca, apice truncata. *Flores* aurantiaci, plerumque maculis parum elongatis fere nigris dense tecti, rarius sparse maculati, 5–6 cm. diametro. *Perianthii* tubus circiter 1·2 cm. longus ; segmenta valde recurva, conspicue biseriata, exteriora anguste oblonga, apice obtusa, basi in unguem 1 cm. longum contracta, 5·3 cm. longa, 1·4 cm. lata, usque ad 1·5 cm. infra apicem maculata ; sulci nectariferi viridescentes, 1·6 cm. longi, marginibus elevatis inflexis albo-papillosa-pilosis (praesertim in parte inferiore) apicem versus minute viridescente-pubescentibus ; segmenta interiora oblongo-lanceolata, 5·3 cm. longa, ubi latissima 1·8 cm. lata, apice abrupte rotundata vel truncata, 8–9 mm. lata, basi angustata, 5–6 mm. lata, usque ad 1–1·5 cm. infra apicem maculata ; sulci nectariferi iis segmentorum exteriorum structura similes, sparsissime pubescentes, papillis carnosis hic illic instructi, dorso prominenter carinati. *Filamenta* pallide aurantiaca, subulata, inferne complanata, apice recurva, circiter 4 cm. longa, glabra ; antherae oblongae, 1 cm. longae, fusco-brunneae, pollinis granulis intense aurantiacis. *Pistillum* ad longitudinem maturam solum post antherarum dehiscentiam perveniens, 4·5–5 cm. altum, glabrum ; ovarium 1 cm. altum, sulcatum, nitido-viride ; stylus pallide aurantiacus, superne incrassatus, in dimidio superiore triqueter, extrorsum curvatus ; stigma parvum, trigonum, rotundatum, pallide aurantiacum. *Capsula* straminea, erecta, obovoidea, trialata, apice truncata, depressa, 2·5 cm. alta, 2 cm. diametro.—*L. warleyense?* Gard. Chron., ser. 3, vol. lii., p. 15 (nomen nudum) ; Journ. Roy Hort. Soc., vol. xxxviii., part 2, p. cxlvi. fig. 118.

Central China. North-western Hupeh, July and October, 1907, *E. H. Wilson* 693.

738. **Muehlenbergia Arundinella**, *Ridl.* [Gramineae-Agrostideae] ; quoad magnitudinem affinis *M. sylvaticae* Torr., spiculis longioribus et aristis brevioribus differt.

Herba 6–12 dm. alta, culmis solidis. *Folia* linearia, acuminata, 25 cm. longa, 6 mm. lata, pubescentia ; ligula ciliata ; vagina pubescens, 14 cm. longa. *Panicula* elongata, stricta, 30 cm. longa, ramis copiosis gracilibus spinulosis. *Spiculae* purpurascente-virides, adpressae, subremotae, brevissime pedicellatae, ciliis ad bases albis. *Glumae* I et II lanceolatae, acuminatae, augustae, 4 mm. longae, purpurascentes vel virides, dorso et marginibus spinulosae ; gluma III (fertilis) straminea, glabra, 3 mm. longa ; arista 1–2 cm. longa, ad basin spinulosa, gradatim in apicem album capilliformem attenuata. *Antherae* quadratae, oblongae, brunneae. *Stigmata* plumosa, atro-purpurea. *Rhachilla* ultra glumam producta, brevis, lata, oblonga. *Lodiculi* obcuneati, truncati. *Caryopsis* cylindrica, angustissima, versus apicem paullo attenuata, 2 mm. longa.

Papua. Dutch New Guinea: Utakwa expedition, Mount Carstensz, 640–3200 m., *C. B. Kloss*; Vanape Valley, *Guilianetti*.

This grass appears to be very common on these mountains. The specimens from the highest camping ground at 3200 m. were, as might be expected, somewhat dwarfed.

739. **Deschampsia Klossii**, *Ridl.* [Gramineae - Aveneae]; affinis *D. caespitosae*, Beauv., sed ligula bifida, panicula grandi, et gluma III trifida arista breviore differt.

Herba caespitosa. *Folia* angusta, 15–18 cm. longa, rigida, subpungentia, vaginis 4 cm. longis; marginibus scarioso-papyraceis; ligula tenuis, scariosa, bifida, apicibus lanceolatis acutis. *Culmus* 60 cm. altus. *Panicula* laxa, magna, ramis gracilibus scabridis 20 cm. longis. *Spiculae* pallidae, biflorae, 5 mm. longae. *Glumae* I et II vacuae, lanceolatae, acuminatae, pallidae, translucentes, carina viridi. *Rhachilla* ad basin utriusque floris albo-ciliata. *Gluma* III lanceolata, trifida, pallida, apicibus tribus acutis; arista e dorso glumae infra lobos, dimidiam partem glumae aequans. *Palea* exaristata, lanceolata, bifida, lobis longis acuminatis. *Stamina* 2, antheris brunneis.

Papua. Dutch New Guinea: Utakwa expedition, Mount Carstensz, Camps xiii–xiv, 3200–3800 m., *C. B. Kloss*.

740. **Arthrostylidium angustiflorum**, *Stapf* [Gramineae-Bambuseae]; affinis *A. Trinii*, Rupr., sed spiculis longioribus multo laxioribus, valvis tenuioribus longius aristulatis, foliorum laminis laete viridibus infra ad basin et in uno latere tenuiter pubescentibus, vaginis ore fimbriis persistentibus munitis distinctum.

Frutex, culmis fistulosis gracilibus laevibus; ramuli permulti, verticillati, plerumque simplices, erecto-patuli, 15–20 cm. longi, gracillimi, teretes, partibus e vaginis exsertis minute puberulis, florentes plerumque 7–nodi, sub anthesi apicem versus 3–4 laminas gerentes. *Cataphylla* turionum ignota. *Foliorum* vaginae arctae, pubescentes, ore albo-fimbriatae, fimbriis 2–2·5 mm. longis persistentibus; ligulae truncatae, ciliolatae; laminae lineares, superne longe tenuiter attenuatae, basi breviter in petiolum brevem puberulum contractae, 5–8 cm. longae, 4·5–5 mm. latae, laete virides, supra glabrae, inferne basin versus et in altero latere fere tota longitudine adpresse minute pubescentes, marginibus scabris, nervis omnibus tenuibus arcte approximatis subaequalibus 30–35 quorum 6 vel 7 exsiccando paulo prominentibus, venulis transversis nullis. *Racemi* terminales, secundi, distichi, leviter curvati, 1·2–2 cm. (quoad rhachin) longi; rhachis pubescens, internodiis inferioribus 3 mm., superioribus 4–5 mm. longis. *Spiculae* pedicello brevissimo puberulo rhachi arcte adpresso suffultae, anguste lineari-lanceolatae, 15–20 mm. longae, laxae, purpurascentes, floribus perfectis 3 rarius 4, rhachillae virides glabrae internodiis tenuibus ad 3·5 mm. longis apice in cupulam minutam ciliolatam dilatatis. *Glumae* duae, dissitae, inferior setaceo-subulata, 1–nervis, 4 mm. longa, superior subulato-lanceolata, tenuissime 5–nervis, 5 mm. longa, aristulatae, glabrae nisi superne ciliolatae, aristula scabra. *Anthoecia* 5–6, infimum ad valvam vacuam redactum, summum hebetatum vel interdum fere ad setam redactum. *Valvae* a latere visae oblique lanceolatae, in aristulam scabram 2–4 mm. longam productae, aristula dempta 6–8 mm. longae, tenues, purpurascentes, 7–nerves, secundum nervos viridi-punctatae vel striolatae, glabrae nisi

superne ciliolatae. *Paleae* lineari-oblongae, 6–8 mm. longae, albidae, in apice ipso ciliatae et in carinis superne ciliato-asperae. *Lodiculae* 3, tenuissimae, hyalinae, ovatae, apice fimbriatae, intermedia minor. *Antherae* albae, 5 mm. longae. *Ovarium* oblongum, subito in stylum brevem constrictum, stigmatibus 2 fere a basi plumosis ad 3 mm. longis.

TROPICAL AMERICA.

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XLV.—VISIT TO THE FORESTS OF SWITZERLAND.

W. DALLIMORE.

By permission of the Director I was enabled to take part in a tour organised by the Royal Scottish Arboricultural Society in conjunction with the Swiss forestry officials, to the forests of Switzerland, during the latter part of July, and the following notes indicate the more interesting items observed.

The areas selected for inspection were chosen by the Swiss forestry officials with a view to directing attention to as many distinct features as possible in the time at our disposal. The principal districts visited were in the neighbourhood of Interlaken, Brienz, Zurich, Chur, St. Moritz and Thusis. Three Federal Inspectors of Forests, Dr. Fankhauser, Mr. Schonenberger and Mr. Merz, were deputed to take charge of the party over different areas, and in each district one or more of the chief foresters attended to explain the working methods. In addition Mr. Pulfer, the First Commissioner of Woods and Forests, accompanied the party during the early part of the tour and Dr. Arnold, one of Switzerland's most eminent forestry officials, took charge during the visit to Winterthur. The party was joined on the last three days by Dr. J. Coaz, the Inspector-General of Forests for Switzerland who, despite the fact that he is in his ninety-second year, is able to undertake a tramp of several hours with little inconvenience.

The ownership of the forests appears to be somewhat involved, for some are owned by the Federal Government, others by individual states or cantons, others by towns or local communities and others again are in the hands of private owners. All, however, are subject to periodical inspection by Government Inspectors, in order to ensure correct methods of management, for in many places not only is a rigorous continuity of the forest system essential to provide the necessary amount of timber required for fuel and manufacturing purposes, but the existence and prosperity of numerous towns and villages, together with the lives of the inhabitants, depend almost entirely upon the steep mountain sides being clothed with trees. Wherever bare mountain sides occur there is constant danger from landslides and avalanches, but where they are well clothed such catastrophes are rare.

On the lower land the activities of the forest officers are concerned mainly with the cutting and marketing of timber, the regeneration of cut areas and road making, but in the more mountainous regions a considerable portion of their attention is directed towards the fixing of land on steep slopes, the provision of barriers to check or

break the force of avalanches, the draining of subterannean water from land liable to slide and the control of mountain streams.

In the more favourably situated areas a considerable yearly income is derived from the forests, and in the case of town or communal forests such income is used for the relief of the rates of all free-men or burghers. Such people are also in receipt of a certain amount of firewood each year. Where a considerable amount of protection work is necessary, however, the expenses are in excess of the income and the deficiency is met by levying a small tax upon those who are likely to derive benefit from the work. Where the expense is great the cost is divided between the State, the canton in which the work is being carried out, and the adjacent towns and villages. In some instances mountain railways owned by private companies benefit, and in such cases the companies share the expense. Most of the country people living in the valleys are small holders and many of them assist with protection or forest work during part of the year. The burden of protective work appears to be taken as a matter of course by the folk concerned, for they know from experience that if the work were neglected they would be liable to lose everything they possessed In a few moments' time, whilst the fear of avalanches, landslides and floods would be ever present. For the same reason it is felt that the best people to undertake the work are those who stand to gain most from it, therefore by employing local labour the authorities contend that the work is performed more thoroughly than might be the case if strangers were imported.

The villagers possess certain rights in some forest areas, such as pasturing their cattle during summer in the mountain meadows which occur here and there amongst the trees. These meadows are termed communal grazings and each householder from the valleys is allowed to send his animals to graze for the summer in the proportion of one cow to four sheep or four goats. The grazing rights in the forest proper are sold, but cattle only are allowed amongst the trees, goats and sheep being excluded for the two-fold reason of their liability to injure trees and to climb precipitous slopes and loosen stones to the danger of the valleys. The requirements of the villagers regarding pasturage and fuel led some years ago to an extension of the meadows and the cutting of a considerable amount of timber on the higher ground, but steps are being taken to limit the range of meadows and to encourage a new growth of timber, whilst the people are being encouraged to surround their meadows with stone walls in preference to wooden railings with a view to saving the higher-grown timber and making use of loose stones which are a constant source of danger. Owing to the improvement in the breed of cattle which has taken place of late, fewer cows than formerly are required to produce a given quantity of milk and it is found more profitable to keep one cow than a number of goats. This has tended to relieve the grazing areas to some extent.

Whenever possible the forests are replenished by natural regeneration, planting being carried on only in places where it is not possible to obtain a natural growth, or when it is desired to introduce a new kind of tree into a particular area. The commonest soft woods are common spruce, silver fir, and Scots pine with

larch and *Pinus Cembra* in some regions, whilst the commonest hard wood is beech followed by oak and ash. A large amount of beech is required for fuel, and soft woods are used extensively for building purposes, pulp and wood-wool. Switzerland apparently suffers very little from wind in comparison to Scotland, for very few wind-blown trees were seen, although, in some cases, openings by felling had been made amongst trees which, had similar ones been made, would in Scotland have been fatal to the whole block. On the mountain sides clear cutting is forbidden by Act of Parliament whilst even on low ground other systems of felling are preferred.

The higher forestry officers receive their early training at Zurich. They attend a middle or secondary school until they are 17 years of age when they proceed to the University for 3½ years. They are then given a minimum of 1½ years of practical work and are ready at the age of 23 to take positions as assistant foresters.

Interlaken.—Monday, July 14th, was spent within a few miles of Interlaken. Train was taken to the Schynige Platte which is about 6,200 feet above sea-level and a few hundred feet above the tree limit. From there a five hours' walk was taken *viâ* Iseltenalp to the protection works at Schiltriesete, Sengg and Rischbachriesete. The greater part of the journey was along precipitous mountain sides which were generally fairly well clothed with spruce, with here and there communal meadows. In some places, however, there were considerable bare areas and loose ground and it was in such places that protection work was in progress. Some of the woods are 200 years old, but many areas have been planted during the last 50 years. About the middle of last century Interlaken suffered severely from floods and the mountain sides in various directions were planted with trees in order to prevent this. The scheme is said to have been quite successful, for floods are now unknown in the town. Twenty years ago Mannlichen was very subject to avalanches of stones, therefore a scheme of protective work was inaugurated and worked by the inhabitants of the neighbourhood. This has been in progress ever since and somewhere about 500,000 francs have been spent. In the more dangerous places strong retaining walls have been built; in other positions strong stakes and branches have been used to fix the ground. The strong surface about the higher points was planted with *Alnus viridis* and *Pinus Cembra*, and the lower parts with *Alnus incana* and spruce. About the time when work was commenced on Mannlichen great devastation was caused at Rischbachriesete by landslides and avalanches. To prevent a recurrence, Dr. Fankhausen instituted a system of protection works. He first controlled the subterranean water by drainage, then built a series of walls on the mountain side to form gigantic steps or terraces. Alders were then planted between the loose stones and what was originally bare rock is now being covered with trees, and the houses in the valley below are considered to be quite safe. Altogether about 700,000 francs have been expended upon the work. In another place where a landslide occurred many years ago and the surface had become clothed with trees some further movement was observed. This has been checked by building a strong retaining wall at the bottom of the weak part and by carrying out certain drainage works.

Brienz.—On July 15th the protection and afforestation works on the Upper Urseren, and the collecting ground for the Tracht-boch above Brienz were inspected. The land in this locality rises rapidly by a series of steep terraces to a height of upwards of 7000 feet, whilst the valleys are narrow. The rocks suffer badly from erosion and until recent years avalanches of snow and stones were of regular occurrence, which made existence in the various hamlets very precarious. At the same time agriculturists about Brienz suffered serious loss from time to time by the violent waters of the Tracht-boch bringing down large quantities of stones and other débris from the heights around and distributing them over a considerable area of cultivated ground.

Nearly a century ago an attempt was made to control the stream but the results were unsatisfactory, and it was not until 1870 that a further effort was made. About that date a wide and deep paved course about 1¼ mile long was built to connect the stream with the lake and prevent the washing of the land. This proved successful, so far as it went, but even then there was no definite control of the volume of water, and about 20 years ago the various hillsides draining into this stream, which had previously consisted of bare stony ground interspersed with communal and private grazings, were purchased by the town of Brienz and placed in the hands of the forest officers. As much as possible of the higher land was covered with grass as a check to erosion and a dam was constructed to regulate the flow of water as it passed into the artificial course. So well has the water been regulated that it now passes to the lake in a regular stream, very little difference in the flow being noticeable in moderately dry and wet weather. The next work was to fix the steep slopes of the mountain sides. To effect this, numerous wide strong walls were built which serve as retaining walls, assist in checking snow slides, and form terraces on which to plant trees. Much of the surface consists of crumbling rock and the first vegetation established in such places was grass. This was cut in turves, carried in baskets for a considerable distance and planted in irregular lines. Seeds of various plants peculiar to the district were gradually deposited and a mixed vegetation appeared, then young trees were inserted which are now growing freely. The higher positions are above the natural tree line for the district and have been planted with *Pinus Cembra* and *Pinus montana*. Lower down spruce, silver fir, and Scots pine are employed, with *Alnus incana* to fix the soil. The trees on the higher ground are planted in clumps with open spaces between. This system is practised in order that the ground may be warmed better than if the trees were evenly distributed over the whole area. Although a considerable amount of work has been accomplished there is still much to do and men are engaged upon wall building throughout the summer months. In some parts strong stakes are used to break up avalanches, but walls are found to be generally more satisfactory. The more fertile parts of these mountain sides originally gave pasturage to 2000 goats, but neither goats nor cattle are now allowed upon the land.

One disadvantage has been observed in the checking of avalanches The snow melts on the higher ground and the water sinks into and

saturates the loose soil and stones, draining out at a lower point. This tends to create landslides, therefore steps have had to be taken to drain such areas.

The town of Brienz at first employed 30 men on its protection and afforestation works but 10 only are employed at the present time. During winter they work on the lower grounds. In April planting is commenced on the lower slopes and the work is gradually carried upwards as the snow melts. Summer is spent on the higher ridges building walls, &c., and in early autumn the return journey is made. Accommodation is provided for living and sleeping high up on the mountains during summer. At that time the men work 11 hours a day and receive from 3*d.* to 5*d.* an hour according to length of service.

A considerable amount of wood carving is carried on in and about Brienz and the art is taught in the schools. Upwards of 1700 hands, including men, women and children, make this their occupation, whilst others work at it during the winter months and in the evening. Some of the more expert workers earn from 10 francs to 15 francs a day, whilst others may not make more than 3 francs or 4 francs.

Zurich.—Zurich was the next centre visited, a brief stay being made at Lucerne whilst on the way. In the vicinity of Zurich some of the best managed forest land in Europe is said to exist and the areas visited were certainly in remarkably good condition.

July 17th was spent in the Sihlwald, the town forest of Zurich. It has belonged to the town for upwards of 1000 years and is situated several miles south of the town in the valley of the Sihl. It covers about 2584 acres of steep hill sides, at altitudes varying from 1600 to 3200 feet above sea level and consists of a fertile clayey soil mixed with disintegrated sandstone, overlying soft sandstone. The climate is mild and damp, the annual rainfall being about 60 inches. Snowstorms are experienced as early as September and as late as May, and cause considerable damage to broad-leaved trees, more particularly to beech. No damage, however, is reported from wind. Late spring frosts sometimes do a good deal of injury and this year the ground was frozen to a depth of 6 inches for 4 days at the end of April. Throughout the country complaints are made of the severe frosts experienced in April this year, and in most parts the branches of walnut trees were cut back into wood from 4 to 6 years of age. Practically the whole of the fruit crop was also ruined at that time.

The timber in the Sihlwald during earlier years consisted almost entirely of beech, as the principal object of its upkeep was the supply of fuel for the town. With the improved means of import of coal, however, less wood was necessary and trees required for other purposes were encouraged. The forest now consists of about 60 per cent. beech ; 10 per cent. ash and maple ; 30 per cent. spruce, silver fir, larch and Scots pine ; and 10 per cent. single trees such as elm, birch, cherry, mountain pine, yew, &c. Larch is only encouraged on dry sites and in open situations. In such places it gives excellent results, forming tall, clean trunks with little taper. It was first used in 1767. As affording an idea of its growth, a tree 67 years old was found to be 120 feet high with a girth of 5 feet at 5 feet above the ground.

For convenience of management the forest is divided into 20 compartments and is worked upon a 110 years rotation. Except that the rotation is a few years longer in the present day a somewhat similar system of management has been maintained since the 14th century. The longer rotation has become necessary owing to the gradual change in the kinds of trees grown.

Natural regeneration is relied upon whenever possible but spruce and larch are often planted. A regeneration period of 15 years is allowed, at the end of which time the seed trees are removed. At the end of 5 or 7 years a thinning is made, suppressed and badly formed trees being removed. Subsequently, until the final thinning is given at 70 years of age, thinnings are conducted every 5 or 7 years until the trees are 40 years old and every 10 or 14 years afterwards. Conifers, ash and maple are encouraged in preference to other trees. A strict account is kept of all thinnings, for from the earliest date they can be made into faggots, so that at the end of the rotation an exact account of the yield of each compartment is obtainable. During the first 30 years it is said that about 1000 cubic feet of timber per acre is removed. At 90 years of age one third of the whole volume is cut, the remaining trees being cut between that age and the end of the regeneration period. The final crop averages about 6,000 cubic feet to the acre.

There are 22 streams throughout the forest and in most instances it has been necessary to build proper falls and paved courses in order to check erosion. Owing to the steep nature of the land and the absence of hard stone, there are only a few roads and most of the timber is carried down the hills by slides, or tramways. In winter sledges are used and in summer wheeled trucks. Up to 5 tons of timber can be sent down at once on a sledge or truck. A considerable amount of firewood is cut into regulation lengths on the hills. Some of this is tied in bundles and sent down on sledges, but the greater proportion is sent down a transportable slide with a gradient of one in four. After a temporary slide has been laid and the wood collected and cut to the required length it is said that four men can send down as much as 7000 cubic feet in a working day of 9 hours.

The trucks and sledges used for the heavier wood are returned to the top of the hill by the aid of cattle and with regard to these a curious and interesting point was mentioned. The cattle used for this purpose are all hermaphrodites. These animals, to the extent of probably not more than one per cent., are born regularly in the Brunig district and are reserved as far as possible for forest work. From 750 to 800 francs is the price of such an animal, whilst a normal animal of either sex, or a bullock, can be procured for 600 francs.

All the timber grown on the Sihlwald is manufactured in a municipal sawmill situated in the valley and connected with both the forest and State railways. A large quantity of ash is made into tool handles, coniferous wood is cut into planks, &c., or impregnated with a 2 per cent. solution of copper sulphate and used for poles, whilst some of the spruce and silver fir is made into wood wool. The firewood is also distributed from this centre. It is all tied into bundles. The larger wood is cut into lengths of about

2½ feet, and split until about 3 inches in diameter. About 12 pieces are placed in each bundle and 100 bundles are sold for 80 francs. Smaller wood for fire lighting is cut about 7½ inches long and is made into round bundles each encircled by an iron band. The bundles are 20 inches in diameter and 100 are sold for 25 francs.

The officials consist of one forest-master, one assistant forest-master, four forest-guards, one sawmill-master, three clerks, and 120 labourers. The last named receive 5 francs 40 cents a day when they are first engaged and rise to 6 francs 40 cents a day. Altogether the net annual income from the forest area amounts to 80,000 francs.

Winterthur.—On July 18th the town forest of Winterthur was visited. This extends to about 3000 acres and is entered from the outskirts of the town. It has belonged to the town since the year 1264, at which date it was presented by Prince Rudolf of Hapsburg. The geological formation is similar to that of the Sihlwald, a fertile loam formed partly by the erosion of sandstone, overlying a bed of soft sandstone, but the gradients are easier and amenable to road-making. The forest officers have taken advantage of this and an excellent system of roads has been perfected by which all the timber can be extracted.

Climatic conditions differ from those of the Sihlwald, the annual rainfall being returned as 40 inches against 60 inches in the Sihlwald. A different system of management also prevails. Previous to 1898 clear felling by the strip system was practised, but owing to difficulties experienced in regeneration, that was discontinued, and felling and regeneration by groups adopted. By this means groups of trees of varying ages will eventually be found side by side instead of sections of different ages as in the Sihlwald. In this particular district the small group system of regeneration is said to be more economical than that previously in vogue, whilst the landscape effect is not disturbed.

The fertile ground favours the rapid growth of brambles and other coarse weeds where openings are made, and it is said to be easier to wage effective war against them by the small group system of felling and regeneration than when a considerable area has been clear felled. Another argument urged in favour of the system is that the quality of the soil is maintained in the highest degree by only uncovering small areas at once, therefore, by that means it is possible to obtain the best returns from the ground. Under this system of management the trees on an area 30 or 40 yards in diameter are felled, leaving a number of the best trees of desirable species as mother trees. A long regeneration period, extending to 30 or 40 years, is allowed for the mother trees being gradually removed. The minimum amount of injury to young trees is said to occur when every mother tree is felled with its head towards the road for it can then be pulled out small end first. During the regeneration period other groups will be cut and as young trees appear, old ones about the outskirts will be removed to give room and the different groups of young trees will gradually unite. The working plans are based upon the estimate that the whole forest will be cut over and regenerated in from 120 to 140 years.

Under the old system of management it is said that the net return per annum worked out at 71 francs per hectare per annum. This was raised in the early years of the group system to 121 francs per hectare per annum and the last three years has shown a return of 150 francs per hectare per annum. At the same time the standing timber is considerably heavier than ever before. The whole average return from the forest, including branches, thinnings and final fellings is placed at 8,700 cubic metres per annum. In this forest it is possible to dispose of the branches of trees at a profit. They are used for covering and protecting plants in winter.

Taking the forest throughout, the different kinds of trees are stated to be represented by 40 per cent. spruce, 30 per cent. silver fir, 10 per cent. other conifers, and 20 per cent. hardwoods. The trees grow to a considerable height, 120 to 140 feet being about the normal when fully grown, although some are said to attain a height of 150 feet. They are peculiar by reason of their great length of clear trunk and small taper. A silver fir log lying on the ground was measured. The base was 2 feet 6 inches in diameter and the point where it was cut off at 92 feet from the base measured $11\frac{3}{4}$ inches in diameter. At the point of the forest where the heaviest stand of timber occurs it is said to total 14,000 cubic feet to the acre.

In some parts patches of heavy land occur; on these alders are planted as a preparatory crop for silver fir which succeeds better than spruce in such positions. The boundaries of the forest are not stationary for new areas are constantly being added and it is estimated that at least 2000 acres have been used for agricultural purposes at one time or another.

The timber is not manufactured by the forest authorities but is drawn to the forest roads and sold by public auction.

It will thus be seen that in two forest areas so close together as those belonging to the towns of Zurich and Winterthur a considerable difference of management occurs, yet both are returning a good annual income.

Chur.—The town or communal forests of Chur were visited on July 21st. These cover an area of 5000 acres of steep mountain sides varying in elevation from 2000 to 6000 feet. The principal trees are spruce and silver fir, with a fair percentage of beech below 4,000 feet, and here and there Scots pine and larch. Beech is encouraged on account of the fertilising properties of its leaves, and is almost a pure crop in dark valleys. Larch is also encouraged as the wood is more valuable than that of any other conifer. It, however, can only be grown successfully on the south sides of the mountains and thrives better in groups than when planted as isolated trees. It succeeds to the limit of tree growth. The forests are divided into narrow felling belts or sections of 100 to 200 yards in width and the trees are removed by selection of single trees or by group felling. As far as possible natural regeneration is encouraged; beech and larch are, however, artificially introduced. Much of the timber grows to a considerable height and silver firs lying on the ground were found to be 130 feet in length.

Formerly the timber was brought down from the higher parts by slides in natural depressions in the ground but the system injured

both ground and timber to such an extent that it has been discarded and an elaborate system of forest roads is now being made by which all timber can be brought down by sledges in winter. Silver fir grown in this region forms very good timber and it is said that logs 20 to 30 feet long were sent to Zurich and used for piles for the foundation of the town hall.

Larch is quite free from fungus diseases but suffers to some extent from the larch-miner moth (*Colephora laricella*, Hbn.), whilst a species of mistletoe is very prevalent upon silver fir.

The forests of Chur give employment to 50 labourers regularly and to 120 during the summer months, and they are païd from 4 francs to 5½ francs a day of 10 hours. After the planting season is over many of these men are employed in roadmaking. The idea appears to be general throughout the country that a good system of well-made roads is essential to the success of forestry and wherever roads can be made slides are being abandoned in their favour, although the initial expense of roads is very heavy. Within the last few years 50 miles of forest roads have been made by this one commune. These are said to have cost about 20 francs per lineal metre. Of the expense the town has borne 70 per cent., the canton 10 per cent., and the state 20 per cent. The comparatively small proportion borne by the canton is probably due to the fact that most of the forest areas in the canton of Graubunden are communal forests, very little being owned by the canton.

Engadine.—On Tuesday, July 22nd, a journey was made to St. Moritz and Pontresina. In this region the Swiss stone pine (*Pinus Cembra*, L.) and the common larch take the place of spruce, silver fir and other trees growing on the land drained by the Rhine and Rhone. Spruce is still seen but it is very small and does not grow sufficiently rapidly to make it a commercial success. Between the elevations of 6000 and 7000 feet larch and *P. Cembra* attain a considerable size and several successive larches girthed 10 feet, 8 feet, 9 feet 5 inches, and 5 feet 8 inches respectively at breast high. These trees were between 250 and 300 years old. In this region one tree was cut which showed 800 annual rings. Above 7,000 feet the trees rapidly deteriorate, soon becoming mere bushes. A peculiarity of the trees in this region is their thick rugged bark, a great difference being noticeable between these trees and the ones noted in other districts. A considerable amount of protection work, wall-building, &c., is being carried on, and *Pinus Cembra* is being planted together with *Picea pungens*, Engelm., up to a height of 8000 feet.

Both are thriving, but they experienced a check last winter on account of late growth and improper ripening of the wood. The timber of *Pinus Cembra* when cut from trees grown for ornamental purposes in this country is very knotty, and the same condition appears to obtain in naturally-grown timber. The older woods, however, appear to be rather on the thin side and timber from areas more recently planted may be cleaner.

By reason of Pontresina becoming a popular tourist resort it has increased rapidly in size of late years, and to protect it from avalanches, protection operations, which are claimed to be the largest in Europe, are being carried on. The mountain sides are

being protected by walls up to a height of 10,000 feet. These walls are 4½ feet wide on the top and more below and cost about 6½ francs a cubic metre. Already about 320,000 francs have been spent and 100,000 Cembran pines have been planted.

In addition to the forest areas above mentioned, protective works at Thusis were examined, and a visit was paid to one of the town forests of Lucerne. The botanical gardens and town gardens of Zurich and Berne were visited, also the experimental forest garden at Adlisberg and a paper factory at Landquart.

The forest garden at Adlisberg is under the direction of Prof. Engler, and he is conducting numerous experiments with seeds of Scots pine and spruce. Seeds have been collected from many widely separated areas and from trees growing under widely different conditions. The plants are now about 8 years old and show a remarkable difference in development. A similar experiment with seed from the same regions is being conducted in Scotland. Other trees under observation are oak, sycamore and larch.

A very interesting group of abnormal spruce was pointed out by Prof. Engler. These plants are now 13 years old and all originated from seed from one mother tree. This tree had a normal leader with a curious bunchy branch system. The seedlings are of three distinct types. About 16 per cent. are of normal habit with single trunks, 31 per cent. have developed several trunks from the base, whilst 53 per cent. form dense, round, cushion-like plants. There are minor variations which make it possible to select forms which could be substituted for almost all of the named garden varieties.

The Botanic Garden of Zurich, over which we were conducted by Prof. Schinz, is arranged solely for teaching purposes and plants exhibiting different peculiarities of growth, leafage, flowering, &c., are arranged in distinct groups. The Garden, however, appears to be much too small for what is required of it and a considerable amount of overcrowding is apparent.

The Zurich town gardens are interesting and contain a number of fine trees, notably *Acer dasycarpum*, *Paulownia imperialis*, *Catalpa bignonioides*, *Cedrela sinensis* and *Tilia argentea*.

In conclusion I have to express my gratitude to the various conductors, who were unsparing in their attentions and always ready to respond when explanations were required.

XLVI.—MISCELLANEOUS NOTES.

Mr. J. W. Matthews.—We learn that Mr. J. W. Matthews, who, on leaving Kew in 1895, was appointed to the post of Assistant in the Municipal Gardens, Cape Town, S. Africa, has been appointed Curator of the newly founded National Botanic Garden of S. Africa which is being established at Kirstenbosch.

Economic Notes, Hull.—To those interested in the commerce of this country a visit to any large shipping port offers much of interest.

While attending the Museums Association Meeting recently held in Hull, the writer took advantage of the opportunity and visited some of the docks. Though during part of the time a labour strike was in progress many interesting products of recent importation were noted, including those mentioned below.

Fruits and Vegetables.—These products are landed direct from the steamers to the river-side quays and during my first visit 12,000 packages of fruit together with general cargo arrived in one steamer from Hamburg, while another from Rotterdam brought 15,000 packages of fruit and general cargo.

Both the fruit and vegetables are sold by rapid auction on the spot and speedily cleared for distribution to all parts of the country. Considerable quantities of "Best Hand-picked Pomeranian Bilberries" packed in chip baskets containing from eight to ten lbs. of the fruit were noted from Hamburg; also half cases of Sicilian lemons; red currants in chip baskets; and sieves of cherries and black currants covered with perforated paper kept in position by stakes of split hazel saplings.

The imports from Rotterdam included red and black currants, bilberries, cherries, cauliflowers, potatoes, tomatoes, gherkins and some drum-shaped packages containing onions. These packages are apparently formed of closely fitting hoops of split Arundo stems with wicker-work ends, sufficiently open to allow of the contents being readily observed.

Another steamer, from Boulogne, brought cucumbers in crates, greengages and apricots in chip boxes and drums, also red cabbage and potatoes in sacks.

Oil Seeds.—Hull being an important centre of the seed crushing industry it was not surprising to find several varieties of oil-seeds in considerable quantities. It may be here observed that Linseed, Soya bean, Cotton and Castor seed are imported in large quantities for local treatment. I was fortunate in obtaining permission to board the "Gafsa" which was discharging into lighters her cargo which consisted solely of 6,800 tons of Linseed shipped from New York, the seed being loosely placed in the hold. Linseed was also observed from Calcutta and Montreal, Castor seed from Bombay and Calcutta, Rape seed from Karachi and Buenos Aires, Cotton seed from Bombay, Smyrna, Hamburg and Dunkirk, but no Soya beans.

Timbers.—In the timber docks enormous quantities of deals and boards, slating battens, railway sleepers, pit props, boxboards and "firewood" were observed from northern ports. The last mentioned product consisted of odds and ends of sawn timber from five feet lengths down to a few inches.

Other timbers noted were oak cask staves from Libau, birch squares and veneers from Abo and birch squares from Helsingfors, oak scantlings and butts from Odessa, boat-hooks and planed boards from Christiania, bundles of broom handles from Archangel and quantities of "rickers" or short poles from several ports.

Food Grains.—Wheat was observed from Karachi, Montreal and Sydney, and Maize from the River Plate.

Other products recognised were Myrobalans (the fruits of *Terminalia Chebula*) from Bombay, and Locust beans (the pods of *Ceratonia Siliqua*) from Cyprus.

J. M. H.

Presentations to Museums.—The following miscellaneous specimens have been received in addition to those previously recorded in the Bulletin :—

The Right Honourable the Earl of Moray, Doune, Perthshire.—Section of Bog Oak and trunk specimens of *Abies cephalonica*, *A. Nordmanniana*, *Picea sitchensis*, *Araucaria imbricata* and *Tsuga Albertiana*.

Capt. W. A. Kerr, V.C., Folkestone.—Samples of paper made from *Bambusa polymorpha*.

Director of Agriculture, Northern Nigeria.—Seeds of *Voandzeia subterranea* and *Kerstingiella geocarpa*.

The British Dyewood Co., Ltd., Glasgow.—Samples of dyeing and tanning extracts.

Messrs. W. Tyzack, Sons & Turner, Ltd., Sheffield.—Eight examples of saws used in forestry, &c.

Mr. T. Inamura, Koshun, Formosa.—Acorns of species of *Quercus* and seeds of several Coniferous trees.

Baron de Worms, Milton Park, Egham.—Section of trunk of *Pseudotsuga Douglasii*.

Messrs. Barron, Elvaston Nurseries, Borrowash.—Model of a tree lifting machine.

Messrs. Boving & Co., Ltd., London, E.C.—Model of a Sampson Stump Extractor.

Major P. J. Waldron, Pitlochry, Scotland.—Specimen of *Gymnosporangium clavariaeforme* on *Juniperus communis*.

Director, Botanic Gardens, Sydney, New South Wales.—Pods of *Serianthes calycina*.

Messrs. F. W. Heilgers & Co., London, E.C.—Specimens of half-stuff and paper made from Bamboo.

Mr. G. Craig Sellar, Norvern, Argyllshire.—Sections of timber of *Tilia petiolaris*, *Acer platanoides*, *Prunus Avium*, *Thuya plicata* and *Taxus baccata*.

Mr. R. N. Rogers, Carwinion, Falmouth.—Log of *Thuya plicata* and specimen of wood stained with the mycelium of *Chlorosplenium aeruginosum*.

Curator, Botanic Station, Dominica.—Samples of Lime juice, essential oil of Limes, otto of Limes and citrate of Lime.

J. M. H.

Hooker's Icones Plantarum.—The 30th volume of this work (or part iv of volume x of the fourth series) has recently been published. It contains an unusual number of species belonging to genera which have not been figured so far, among them eleven that are monotypic, namely Asterophorum (Tiliaceae), Pittosporopsis (Icacinaceae), Murtonia (Leguminosae-Hedysareae), Micholitzia and Microstephanus (Asclepiadaceae), Warpurea (Acanthaceae), Stemmatodaphne (Lauraceae), Klaineanthus, Necepsia, Discoglypremna (these three Euphorbiaceae) and Rolfea (Orchidaceae). Other genera figured in the volume for the first time are Ostryoderris (Leguminosae-Dalbergieae), Edithcolea (Asclepiadaceae), Satanocrater (Acanthaceae) and Spondianthus (Euphorbiaceae). Of special morphological

interest are Hibiscus Watsoni from Upper Burma, a species with large spikes of yellow flowers, buried in a mass of long linear bracts, a yellow Gentiana (G. stylophora) with corollas 5–6 cm. long and 6–7 cm. wide, from Sikkim and Yunnan, an almost completely isolated type, and Chilocarpus anguineus from Sarawak, remarkable on account of its long, vermiform fruits, whilst Pogostemon Rogersii attracts our attention owing to its being the first species of the genus recorded from Africa and Pardenia sokotensis as a curious link between the flora of Nigeria and Madagascar, no close ally being known so far from the African continent. Economically important are Boswellia odorata, a resin tree from Northern Nigeria, only known in the cultivated state, Parthenium argentatum, the Mexican rubber plant known as 'Guayule,' and Styrax benzoides, the source of the commercial Siam Benzoin or, perhaps better, one of the products known commercially as Siam Benzoin.

O. S.

Botanical Magazine for August.—The plants figured are *Stanhopea convoluta*, Rolfe (t. 8507); *Centaurea crassifolia*, Bertol. (t. 8508); *Cytisus supranubius*, O. Kuntze (t. 8509); *Grevillea bipinnatifida*, R. Br. (t. 8510); and *Solenostemon Godefroyae*, N. E. Brown (t. 8511).

The *Stanhopea* is most nearly allied to *S. tricornis*, Lindl., but it has larger flowers and differs in the structure of the lip. It was introduced into cultivation from the province of Antioquia, Colombia, a few years ago by Mr. F. Claes of Etterbeek, Brussels, and first flowered in his establishment in September, 1909. The plant in the Kew collection which provided the material for the figure was presented by Messrs. Charlesworth & Co., of Haywards Heath.

Centaurea crassifolia is endemic in Malta whence it was introduced into the Cambridge Botanic Garden in 1894 by Professor G. Henslow. The plant then received was lost, and was at a later date replaced by one from the garden of the late Sir Thomas Hanbury of La Mortola. From this plant material for the figure was sent to Kew by Mr. Lynch at the request of Professor Henslow. At Cambridge the species has been found to grow well in the Succulent House, under conditions suitable for Sempervivums and similar plants. It is an undershrub with long spathulate fleshy leaves and purple-rose flower-heads nearly two inches across, and is remarkable in the genus in having no appendages to the involucral bracts.

Cytisus supranubius is a very floriferous species with creamy white flowers bearing a broad pink stripe on the standard. It is a native of the Canary Islands and is said to be the most characteristic plant of the alpine region of Teneriffe, where it grows abundantly at altitudes of from 6000 to 9000 ft. The material for the figure was sent to Kew by Sir F. Moore of the Royal Botanic Garden, Glasnevin, where the plant is grown against a wall.

The *Grevillea* is a West Australian species with ornamental foliage and graceful racemes of red flowers. The Kew plant from which the specimen figured was obtained is a leafy shrub about three feet high, and was raised from seed received from the Adelaide Botanic Garden in 1909.

Solenostemon Godefroyae is a new species from the Congo and Angola, and is the same plant as that included in the late Mr. Godefroy-Lebeuf's Catalogue for 1903 under the name of *Coleus Godefroyae*. Material of the same species, collected in Angola in 1873 by Mr. and Mrs. Monteiro, had been referred to *Solenostemon ocymoides*, Schum. & Thonn. A flowering plant was sent to Kew in November, 1903, by Messrs. Sander & Sons of St. Albans, and another plant, which supplied the material for the plate, was received in 1911 from the Jardin Colonial, Laeken, near Brussels. The genus *Solenostemon* is very closely allied to *Coleus* and *Plectranthus*, but may be distinguished by the subequally 2-lipped calyx.

Botanical Magazine for September.—The plants figured are *Agathis vitiensis*, Benth. & Hook. f. (t. 8512); *Rosa foliolosa*, Nutt. (t. 8513); *Catasetum microglossum*, Rolfe (t. 8514); *Iris mellita*, Janka (t. 8515); and *Utricularia longifolia*, Gardn. (t. 8516).

Agathis vitiensis is a Dammar indigenous in the Fiji Archipelago, where it is known as the Dakua. The wood serves much the same uses as deal and is employed by the Fijians for house-floors and for masts, booms and spars. The resin which the trees exude has not been, so far, made an article of commerce but in the interior of the larger islands has been used for burning. The material for the figure was obtained from a plant raised at Kew from seeds presented by Sir J. B. Thurston, then Governor of Fiji, in 1881. This plant is now a tree twenty-five feet in height, and is under cultivation in the Mexican House.

Rosa foliolosa is the South-western Prairie Rose of North America which as a wild species is apparently restricted to the prairie region of Arkansas, northern and central Texas and the Indian territory. It is well characterised by its dwarf habit, its running rootstocks and its fragrant carmine blossoms. It was first discovered by Nuttall in Arkansas about 1820 and later was met with in Texas by Berlandier, Drummond and others. It is rather a rare species in collections of roses. The material for the plate came from the garden of the Rev. Canon Ellacombe, Bitton.

Catasetum microglossum is an interesting species met with for the first time in 1911 in Peru by Mr. W. Fox who found it growing on a dead stump near an Indian house on the River Igaraparana, a tributary of the River Putumayo. This plant was presented by Mr. Fox to Kew where it flowered for the first time in a tropical house in March, 1913, and enabled the figure to be prepared.

The *Iris* figured at t. 8515 was presented to the Kew collection by the Hon. Mr. N. C. Rothschild who had obtained it from Mersina in Cilicia. In identifying it with *I. mellita*, Janka, a native of Thrace, so comprehensive a view of Janka's species is taken as necessitates also the reduction thereto of *I. rubro-marginata*, Baker from Asia Minor and *I. Straussii*, Leichtl., from Western Persia. The original *I. mellita* was first collected by Janka in 1871 on dry slopes in Tschiendem Tepe near Philippople in Bulgaria and it has since been met with frequently throughout Southern Bulgaria. The original *I. rubro-marginata* was described from specimens

collected near Scutari by Mr. W. Barbey and it has since been sent from Smyrna. The original *I. Straussii* was originally sent by Mr. Strauss to Mr. Leichtlin from Sultanabad.

Utricularia longifolia is a Bladderwort which was first met with on Mount Pedra Bonita near Tejuco in the province of Minas Geraes, Brazil in 1840 by Professor Gardner. It has long beèn in cultivation in European collections on account of its showy and rather striking blossoms, but it has also attracted the special attention of morphologists and of practical horticulturists by reason of the extraordinary plasticity of the leaves which may grow out into bladder bearing stolons or may produce from their tips tufts of leaves and stolons and rhizoids. This phenomenon, which is not infrequent in the genus, is in *U. longifolia* unusually striking on account of the size of the leaves. The material for the figure was obtained from the Cambridge Botanic Garden.

Flora of Tropical Africa.—The issue of the concluding part of the first section of Vol. vi of this work, edited by Sir W. T. Thiselton-Dyer, has now to be recorded. The section includes 1,094 pages and has appeared in six parts, the dates of publication of which have been as follows :—

Part I.	pp. 1–192	published	March, 1909.
„ II.	„ 193–384	„	December, 1910.
„ III.	„ 385–576	„	October, 1911.
„ IV.	„ 577–768	„	March, 1912.
„ V.	„ 769–960	„	October, 1912.
„ VI.	„ 961 to end	„	April, 1913.

The orders dealt with are Nyctagineae–Euphorbiaceae inclusive.

The Editor's Preface, in which the history of the production of this important volume has been given in detail, is reproduced below. It is a matter of deep regret that with the completion of the publication of this section Sir W. T. Thiselton-Dyer's editorship of the Flora of Tropical Africa ceases.

"This is the last section of the 'Flora of Tropical Africa' which will be issued under my editorship. The control and supervision necessary in an undertaking of the kind cannot be properly exercised except at the headquarters of its preparation. Some degree of uniformity must at least be aimed at in the work of different contributors. Questions will consequently arise on which the editor must give a decision: difficulties which are readily solved by personal discussion are not disposed of so easily by correspondence.

"The preparation of this section has been protracted. When I retired from the Directorship of Kew in 1905 much of the material available had been worked up by my indefatigable contributor, Mr. J. G. Baker, F.R.S. The continuous access of fresh collections had in the meantime largely added to it. 'In fact the general position with regard to the Flora resembles the 'Curve of Pursuit,' in which the pursuer has to change his direction constantly in the attempt to overtake his elusive quarry. In the case of the smaller

orders Mr. Baker's advanced years made it necessary to entrust the necessary additions to other hands. The *Euphorbaceae* were not so easily disposed of. This vast family will probably prove to supply the dominant constituent of tropical forests. In view of the large access of fresh material and of what had been worked out by Continental botanists it was necessary to recast entirely what had been prepared. This task was generously undertaken by my successor, Lt.-Col. Sir David Prain, F.R.S., and though my name stands on the title-page of the volume, its accomplishment and the merit which attaches to it must for the most part be attributed to his indefatigable energy and critical insight. Mr. J. Hutchinson collaborated with him, and Mr. N. E. Brown, A.L.S., who finds a peculiar fascination in the study of succulent plants, the difficulties of which most botanists find deterrent, undertook the genus *Euphorbia*.

"The present section thus disposes of all that was in view when I retired from Kew. The 'Flora of Tropical Africa' differs from other works in the series of which it is a part in having an official and not a personal character. In the preface in the seventh volume I have given an account of the circumstances of its initation and of those under which, at the instance of the Government, its preparation was resumed.

"In view of what I have said, I can have no doubt that I am adopting the course which is most expedient in the interest of the work in resigning the task of its completion to the present Director of Kew.

"It has been the practice in the more recent works that have been prepared at Kew to conform to the classification and sequence of orders adopted in Bentham and Hooker's 'Genera Plantarum.' Thîs was accordingly done by Professor Oliver, F.R.S., in the first and second volumes. In the third he appears to have preferred the continuous numbering of the cohorts given by Sir Joseph Hooker in his translation of 'A General System of Botany' by Le Maout and Decaisne. Bentham and Hooker, however, in the 'Genera Plantarum' commence a new numbering of the cohorts for *Gamopetalae*. This I have followed in Vol. IV. The numerical sequence does not therefore follow on from that of Professor Oliver, but as the actual sequence adopted by him is that of the 'Genera Plantarum' anyone who cares to do so can readily correct Professor Oliver's numbers. Unfortunately, in Vol. V., a further correction is necessary. By one of those clerical oversights which can only be accounted for by the frailty of human nature, the numbering of the cohorts does not conform to either work. PERSONALES should be ix. instead of xxiv. and LAMIALES x. instead of xxv.

"Although the Old World has always had before it the problem of unknown Africa, it is singular how tardy has been its exploration compared with that of the New. Yet it has been through no lack of curiosity. In the fourth century B.C., and possibly earlier, the Greeks had a proverb preserved by Aristotle, *ἀεὶ φέρει τι Λιβύη καινόν*. At the commencement of our era Pliny, if with a whimsical explanation, recalls the 'vulgare Græciæ dictum semper aliquid novi Africam adferre.' In our twentieth century the novelty descends on the bewildered botanist in a continuous flood, and more than one generation will come and go without seeing it exhausted.

"A quarter of a century separates the three volumes of the 'Flora of Tropical Africa' issued by Professor Oliver from the fourth edited by myself. Nothing more was claimed for the former than that they were a 'repertory' of what was known of the vegetation of the time, imperfect as that knowledge was. Dr. Stapf in a memorandum in the 'Kew Bulletin' for 1906 (pp. 239, 240) has brought out in a striking way the immense progress it has made in the interval, 'For every three species then known, five species have since been added.' There is therefore already room for a supplement to the first three volumes of more than equal bulk. It would not be becoming for me to lay the burden on Kew. But it may be hoped that if, as may be confidently expected, it is able to complete the 'Flora of Tropical Africa' on the lines already laid down, substantial encouragement will not be wanting from H.M. Government to enable the Kew staff to add further to our knowledge of the vegetable resources of a portion of the earth's surface in which as a nation we have so large a stake.

"For the amended definition of the regions into which the area of the Flora is divided, reference may be made to the preface to the seventh volume.

"The further collections made use of in the present volume and not previously acknowledged are as follows:—

"I. Upper Guinea.—Aug. Chevalier, French Guinea; C. E. Lane-Poole and C. W. Smythe, Sierra Leone; Aug. Chevalier, Ivory Coast; J. Anderson, R. W. Brent, T. F. Chipp, A. E. Evans, A. C. Miles, and H. N. Thompson, Gold Coast; R. E. Dennett, H. Dodd, G. C. Dudgeon, J. H. J. Farquhar, Dr. Lamborn, J. C. Leslie, T. D. Maitland, Mr. and Mrs. P. A. Talbot, N. W. Thomas, A. H. Unwin, and J. L. Williams, Southern Nigeria; Dr. J. M. Dalziel, Col. E. J. Lugard, Dr. A. C. Parsons, B. E. B. Shaw, and C. C. Yates, Northern Nigeria.

"II. North Central.—Aug. Chevalier, Chari Region, Dar-banda, French Congo, &c.

"III. Nile Land.—Dr. R. E. Drake-Brockman and R. J. Stordy, Southern Abyssinia; A. F. Broun, Sudan; M. S. Evans, R. Fyffe, and C. B. Ussher, Uganda; E. Battiscombe, M. S. Evans, E. E. Galpin, D. E. Hutchins, H. Powell, and W. S. Routledge, British East Africa.

'IV. Lower Guinea.—J. Gossweiler and Dr. F. G. Wellman, Angola; E. E. Galpin, German South-West Africa.

"V. South Central.—Rev. F. A. Rogers and F. Thonner, Belgian Congo.

"VI. Mozambique Distr.—J. T. Last, Zanzibar; M. T. Dawe, W. H. Johnson, and J. Stocks, Portuguese East Africa; J. M. Purves, Nyasaland; Mrs. O. Colville, E. E. Galpin, Miss L. S. Gibbs, Rev. Dr. F. C. Kolbe, H. G. Mundy, and Rev. F. A. Rogers, Rhodesia.

"The most cordial acknowledgments are due to Professor I. B. Balfour, Monsieur G. Beauverd, Professor A. Borzi, Dr. J. Briquet, Monsieur H. Courtet, Dr. A. Engler, Dr. J. W. C. Goethart, Dr. J. A. Henriques, Professor H. Lecomte, Dr. C. A. M. Lindman, Dr. C. H. Ostenfeld, Professor R. Pirotta, Dr. A. B. Rendle, Professor Hans Schinz, Professor E. Warming, Dr. R. Wettstein,

Dr. E. De Wildeman, and Dr. A. Zahlbruckner, for the generons loan of type specimens and other material from the herbaria under their charge.

"I must add my final acknowledgments of the aid given me by Assistants in the Herbarium of the Royal Botanic Gardens; to Mr. C. H. Wright, A.L.S., in preparing the manuscript for the press and in checking the proofs; and to Mr. N. E. Brown, A.L.S., for working out the geographical distribution.

"For the detailed topography the third edition of the 'Spezial-Karte von Africa' (Gotha: Justus Perthes, 1893) has been chiefly used."

W. T. T.-D.

Witcombe; February 17, 1913.

Entebbe Botanic Garden.—The report of the work of the Botanical, Forestry and Scientific Department of the Uganda Protectorate for the year ending 31st March, 1912,* is published in a thin foolscap folio volume containing 26 pages and 17 pages of Appendices.

The section devoted to the botanical department is illustrated by several excellent reproductions of photographs of indigenous trees, economic plants and views of the garden. Among these are shown a fine example of *Antiaris toxicaria* (misspelled *Antiaria*), a tall handsome tree with a long clean trunk and spreading crown, a beautiful group of *Raphia monbuttorum*, the fernery, a prolific coffee-plant, and a group of Para rubber trees with an undergrowth of *Mucuna gigantea*, a leguminous climber which has proved to be the most suitable plant for ground-shade and green manure.

The forestry section contains pictures of a felling area, a saw-mill and *Funtumia* trees, all in the Mabira forest. Owing to the department having been understaffed during the period under review, little work has been done, but the chief future policy will be the encouragement of the exploitation of native timber, which has been found to resist the ravages of rot and attacks of white ants much better than the imported material now used.

The scientific section is now provided with a suitable museum in which are housed specimens of native craftsmanship and collections of specimens illustrating the industries and natural resources of the country. The results of the examination of various samples of rubber obtained in the Protectorate and shown at the International Rubber Exhibition in London are given in detail.

The report concludes with meterological notes and tables of observations taken at various stations in the Protectorate.

J. H.

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* Uganda Protectorate. Annual Report of the Botanical, Forestry and Scientific Department for the year ended 31st March, 1912. Government Printer, Entebbe, Uganda, 1912.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8.] [1913.

XLVII.—A BOTANICAL EXPEDITION TO THE CANARY ISLANDS, 1913.

(With Plates.)

T. A. Sprague and J. Hutchinson.

Our ship left Liverpool on May 17th and called at Madeira on May 22nd, when we took the opportunity of ascending the mountain railway at Funchal to its present terminus, which is situated about 2600 ft. above sea level. The ascent occupied about half-an-hour, the lower part of the track traversing much-terraced hillsides, on which were grown small patches of sugar-cane and vines, numerous fruit-trees such as peaches and loquats, and a great variety of tropical and subtropical trees and shrubs, amongst which the most conspicuous were *Jacaranda acutifolia* (commonly known as *J. mimosaefolia*) and *Wigandia caracasana*.

The subtropical zone of cultivation was succeeded by plantations of *Pinus Pinaster*, which extended upwards to an altitude of about 3400 ft. The cobble-paved mountain road led upwards past the terminus through the pine plantations, and after a time followed the side of a steep ravine. Occasional glimpses were obtained through the trees of the opposite hillside, which in places was yellow with broom.

The undergrowth in the pine plantations consisted chiefly of small bushes of heath (*Erica scoparia*). The white-flowered *Eupatorium adenophorum* was very common by the side of the track in fairly damp places under the shade of the trees, and a singular-looking little herb (*Sibthorpia peregrina*) with long trailing stems, leaves like those of ground-ivy, and pretty yellow flowers, occurred in some abundance on the grassy banks at the side. Specimens of these and a few other plants were collected, and photographs were taken of the head of the ravine, and of the vegetation in the zone above the pine plantations. This consisted principally of a single

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species of tree* which grew gregariously on the ridges and upper slopes of the ravine, and of rounded bright green bushes of *Erica scoparia*, which covered much of the lower slopes (*see* Plate 1). At a bridge across the ravine known as the Ponte da Ribeira Calles, 3500 ft., we had to turn back in order to get down to the town by nightfall.

On our arrival at Santa Cruz, Tenerife, on the morning of May 24th, we found a letter awaiting us from Dr. G. V. Perez suggesting that we should push on to Puerto Orotava. We left Santa Cruz in the afternoon by the electric tram. The country as far as Laguna was much cultivated and had a very burnt-up appearance, and our first impression of Tenerife was rather disappointing, but between Laguna and our immediate destination, Tacoronte, the vegetation was much fresher. The journey occupied about two hours. In the evening we examined the vegetation of a small deep and narrow gully.

Next morning we started off at 6 a.m. to the celebrated wood of Agua Garcia, which we reached about 6.45 Near the bottom of a small ravine were fine trees of the Viñátigo (*Phoebe indica*) with very stout trunks, and good examples of the large-leaved Canarian holly (*Ilex platyphylla*). Several beautiful herbaceous plants were in full flower, including *Ranunculus cortusaefolius*, *Geranium anemonifolium* and a pink-flowered Labiate (*Cedronella canariensis*) On the ridges and the higher parts of the slopes were fine specimens of the tree-heath (*Erica arborea*) and the small-leaved holly (*Ilex canariensis*). *Viburnum rugosum* was seen both in flower and fruit; it is a shrub 5 ft. high or more, and forms a large part of the undergrowth in both the damper and drier parts of the wood. Among the climbers were a *Rubus* which ascended the trees of the Viñátigo to a height of about 40 ft., and a *Smilax* which occurred among the tree-heaths and small-leaved hollies in the upper and drier parts.† After breakfast, we took the first motor-bus to Orotava, where we arrived about 10.30.

There we were met by Dr. Perez, who was accompanied by Domingo Hernandez, seed-collector for Messrs. Wildpret Bros. The remainder of the morning was spent under their guidance, seeing the grounds of the Grand Hotel Taoro (formerly Hotel Humboldt), and an interesting garden belonging to Mrs. Wethered, where many endemic Canarian plants are cultivated. On a lava stream alongside there were fine examples of *Sonchus leptocephalus*, which is remarkable for its extremely dissected leaves. The habit is shown in Schröter, Nach den Canarischen Inseln, plate 10, fig. 2.

In the afternoon a visit was paid to Dr. Perez's garden at Puerto Orotava. Among the more noteworthy plants seen were various species and hybrids of *Statice*, *Echium simplex*, *E. Bourgaeanum*, *E. Pininana*, *E. fastuosum* and *E. candicans*, young Dragon-trees, various critical forms of *Cytisus*, *Retama monosperma* and *R. rhodorhizoides*, *Convolvulus floridus* and an arborescent *Sonchus*.

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* Not identified, as owing to lack of time we were unable to climb up the hillside to where the trees grew.

† An interesting account of the wood at Agua Garcia is given by M. Emile Jahandiez in the Bulletin du Chêne, 1913; and it is also dealt with by Schenck, Veg. Canar. Ins. p. 316.

ERICA SCOPARIA.

[*To face page* 288.

FICUS ROXBURGHII.

To face page 289.]

Afterwards we went to Los Frailes, a tract of lava country belonging to Dr. Perez. Among the more interesting plants collected were a boraginaceous plant with small white flowers (*Messerschmidia fruticosa*), *Withania aristata* and *Periploca laevigata*. *Rubia fruticosa* was abundant everywhere. Tangled masses of dodder were found on ivy-leaved *Pelargonium*, growing so thickly that it could be gathered in handfuls. There is a fine avenue of the Canarian date-palm (*Phoenix canariensis*) on the estate.

An early start was made next day (May 26th) in company with Domingo Hernandez for the lava stream below the Montaña de la Horca. *Davallia canariensis* was very abundant among the blocks of lava, and another fern, *Gymnogramme leptophylla*, was fairly frequent. Schimper's 'tufted-leaved plants' (Federbusch Gewächse)* were represented by *Kleinia neriifolia* and *Euphorbia Regis-Jubae*. Among other characteristic plants were *Rhamnus crenulata*, *Gonospermum fruticosum*, *Artemisia argentea*, *Lavandula abrotanoides* and a fine white-flowered *Sempervivum*. Flowering and fruiting specimens were obtained of the rare *Ruta pinnata*.

A visit was next paid to the Botanic Garden,† where we were cordially received by the Curator, Señor Juan Bolinaga, by whose exertions many additional plants have been introduced to the Garden in recent years. A special article would be required to do justice to the Botanic Garden: many tropical and subtropical ornamental and economic trees are now in cultivation, and some of the more interesting endemic plants are represented. Fine examples were seen of *Pandanus utilis*, numerous palms, several species of *Araucaria*, *Hibiscus elatus*, 45 ft. high, *Hibiscus rosa-sinensis*, 15 ft., covered with scarlet flowers, *Ficus nitida* and *F. Roxburghii*. The latter is remarkable for producing figs on the trunk right down to the level of the soil, as well as on the large branches (*see* Plate 2). Perhaps the most beautiful thing seen was a tree of *Albizzia Julibrissin* with a wealth of delicate flesh-coloured flowers.

On leaving the Botanic Garden we met Dr. Perez, who drove us up to his garden at Villa Orotava, stopping at the Plaza de Frankei on the way. Here we got specimens of the rare *Rhamnus glandulosus*, which was stated to have been brought from Las Mercedes. The frequent use of native trees is a praiseworthy feature of the public gardens in the Canaries.

There are two interesting groups of *Laurus canariensis* in the garden at Villa Orotava which illustrate the vegetative mode of reproduction of the species: one consists of the base of a large trunk surrounded by a circle of five smaller trees which evidently arose as suckers from the central one; the other has several relatively small trees in a circle, the middle one having completely disappeared. Among other trees seen were *Juniperus Cedrus* ♂ and ♀, *Heberdenia excelsa* and *Arbutus canariensis*. There was a fine bush of *Cytisus Spachianus* 15 ft. high, said by the late

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* Schenck, Veg. Canar. Ins., p. 271.

† An interesting account of this Garden was given by Sir D. (then Dr.) Morris in Journ. Roy. Hort. Soc., 1896, vol. xix., p. 78, with a select list (p. 107) of the plants observed there in 1893.

Mr. Hermann Wildpret to have come from the wood at Agua Garcia and distributed by him as *C. Hillebrandii*.

In the afternoon we inspected the "Hijuela" garden, the full name of which is 'Servicio Agronomico Nacional, Hijuela del Botanico.' This contains a great variety of subtropical trees and shrubs maintained in a very healthy condition, including *Corynocarpus laevigata*, *Maclura aurantiaca*, *Sterculia platanifolia*, *Cocculus laurifolius*, *Fabiana imbricata* and a fine example of *Quillaja saponaria*. There was a beautiful specimen of *Fuchsia arborescens* in full flower looking almost exactly like a lilac at a distance, hence its other name *Fuchsia syringaeflora*. Two varieties of the bushy *Fuchsia corymbiflora* were cultivated, one with crimson flowers, the other crimson and white.

In the evening Dr. Perez drove us down to Puerto Orotava and pointed out some features of interest such as an old wine-press with a massive beam of the téa wood (heart-wood of *Pinus canariensis*), which is almost imperishable ; large logs are no longer obtainable locally in Tenerife. In a garden beside the road were some plants of *Lotus peliorhynchus* (Bot. Mag. t. 6733), which had apparently disappeared as a wild plant and was for a long time known only in a garden at Orotava ; it was subsequently rediscovered in the south of the island. The low volcanic hill of the Montaña de la Horca (Gallows Mountain) was covered with a striking association of the Vinagrera, *Rumex Lunaria*, a large shrubby dock.

The well-known fodder plant, Tagasaste (*Cytisus proliferus*) was extensively cultivated on the lower slopes (see *K. B.* 1891, 239 ; 1893 115). It should be treated like an osier, *i.e.*, cut back regularly so as to produce plenty of young shoots and at the same time prevent its growing into a tree. The low growth is the result of pruning and not a varietal character as supposed by Schröter (Nach den Canarischen Inseln, p. 65). The comparative failure of Tagasaste as a fodder-plant in the colonies is attributed by Dr. Perez to improper treatment, the bushes being allowed to become arborescent. Horses generally refuse it at first, but can easily be taught to like it. The Algarrobo, *Ceratonia Siliqua*, is much cultivated, and is seen here and there along the roadside.

On May 27th a banana plantation in the neighbourhood was visited. The species grown in the Canaries is the dwarf *Musa Cavendishii*. The area under cultivation has increased enormously in recent years, and very high rents are paid for suitable land. Irrigation is essential, and is the largest item in the cost of production. In the plantation visited the bunches of fruit were propped away from the stem by small pieces of bamboo to prevent the bananas being deformed by pressure and to ensure freer circulation of air, thus reducing the danger of attack by mould. Each bunch (*racimo*) bore from 12 to 14 hands (*manos*). There were as many as 40 bananas in a lower hand, the number per hand decreasing gradually towards the end of the bunch. An average bunch contained about 400 fruits. One bunch was observed immersed in a pool of water, and on enquiry it appeared that the fruits had shrivelled somewhat, and were being freshened up before delivery to the exporters.

We were delighted to see the island of La Palma* in the evening, outlined against the setting sun. It is only visible from Orotava at sunset during very clear weather.

The unusually clear weather continued on the following day (May 28th), the Peak† being visible at intervals during the morning. As a rule it becomes shrouded by mists about 8 o'clock in the morning, and these usually do not disappear until dusk. They are caused by the rise of moisture-laden sea-breezes which, at an altitude of about 3000 ft., become cooled down sufficiently to cause condensation.

A small steamer lay off the pier awaiting a shipment of bananas, which were being brought down in large wagons drawn by two oxen. The bananas are packed in single and double crates holding one and two bunches respectively. The wood is sent in ready-shaped pieces from Scandinavia, and the crates are made up on the spot. One wagon contained 36 single and 12 double crates, *i.e.*, 60 bunches of bananas altogether.

In the afternoon specimens of a few Canarian trees and shrubs were obtained in Mrs. Wethered's garden by kind permission of the owner. Several of these were afterwards met with in a wild state in La Palma and Tenerife. A few plants were gathered in the Barranco Martianes, the flora of which seemed to be very poor.

On May 29th we left Orotava by the 7 a.m. motor 'bus for Tacoronte, and thence proceeded by tram to Santa Cruz. Between Tacoronte and Laguna there is a fine view towards Tejina, with some good rock scenery. Shortly afterwards, the wooded hills of Las Mercedes came into view, with a table-topped hill in the foreground. These were visited on our return from La Palma, and are described later on. The journey by electric tram from Laguna to Santa Cruz is very bumpy and dusty, at least in the summer, but in the descent to the capital there are fine views of the sharp black peaks and serrated ridges of the Anaga Mountains.

In the afternoon we were courteously received by Don Arturo Ballester, Chief of the Forest Department of the Canaries, to whom we had a letter of introduction. He gave us a letter to the Assistant Conservator of Forests at Santa Cruz de La Palma, and some valuable advice as to places worth visiting in that island.

Our steamer, the "La Palma," was due to leave Tenerife at 8 p.m., but did not depart till after midnight, as there was still a good deal of cargo to be unloaded, including many crates of onions from Lanzarote. On approaching the island of La Palma next morning (May 30th), we could see that the upper and middle slopes of the mountains were still covered with extensive pine-forests. Deforestation has taken place to a much less extent than in Tenerife. The numerous immensely deep ravines (*barrancos*) which furrowed the sides of the mountains were very conspicuous from the sea.

The island is roughly pear-shaped, with the rounded end towards the north. It is 29 miles long and 17¼ miles broad. The centre of the northern half is occupied by an immense crater, the Gran

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* Not to be confused with the town of Las Palmas, the capital of Grand Canary.

† Pico de Teyde, Tenerife.

Caldera, which is over 4 miles in diameter and 5000–6000 ft. deep. This is drained by a deep ravine, the Barranco de las Angustias, which runs in a south-westerly direction to the sea. From the rim of the crater, the highest point of which is about 7700 ft., the surface slopes steeply to the sea on the west, north and east. A high mountain ridge runs from the south-east of the crater to the south of the island.

The capital, Santa Cruz, almost always called "La Ciudad" (the city) by the inhabitants, lies at the side of a coast crater, the Caldereta, 1000 ft. deep, half of which has been washed away by the sea. As we came near to land a gentle drizzle started which continued all day. We were told that rain usually ceases in La Palma before the end of May, and not a drop fell during the remainder of our visit.

In the afternoon we called on Dr. Elias Santos y Abreu, the Director of the Museum, and one of the principal doctors of the island, to whom we had a letter of introduction from Dr. Perez.

The town-hall of Santa Cruz is very interesting. It contains the standard of the Spanish Conquest, and the ancient official manuscript records, which are much worm-eaten, and date from 1554, in which year the previous town-hall was destroyed by fire. The remains of the latter are to be seen behind the present building. A curious oven used for baking bread was noticed high up on the outside wall of a neighbouring house.

A visit was also paid to the museum, where we were cordially received by the officials, and the members of the Cosmological Society. There is a fine collection of articles used by the Guanches, the ancient inhabitants of the Canaries. Among them are numerous earthenware cooking pots elaborately ornamented outside, each vessel having a different pattern; drinking cups, milk-bowls, bone needles, a stone knife, curious hats made of rushes, and necklaces of earthenware beads and of seeds. A collection of dried specimens of La Palma plants is being formed under the direction of Dr. Santos, who devotes to scientific pursuits the leisure of a busy professional life.

A huge crab which was fished up off the island from a depth of 160 fathoms measured 3 ft. across as mounted, and 4½ ft. when fully extended.

On May 31st and June 1st a thorough exploration was made of the lower and middle parts of the Barranco del Carmen, a large ravine to the north of the town.

Nearly 60 numbers of plants were gathered, and five photographs were taken illustrating the vegetation. At the mouth of the barranco there was a very characteristic association of tufted-leaved Euphorbias, *Kleinia neriifolia*, *Lavandula abrotanoides*, low rounded greyish bushes something like wormwood (*Schizogyne sericea*) and straggling plants of *Rubia fruticosa*.

On the upper part of the cliffs there was a good deal of the candelabra-like *Euphorbia* (*E. canariensis*), and the Pitera, *Agave americana*, was frequent on the steep hill-sides. Some of the most interesting plants, such as the endemic *Crassulaceae* and *Caryophyllaceae*, grew in the clefts of the perpendicular rock faces.

In the winter there are sudden rushes of water following heavy rains in the mountains, but the barranco is dry for the greater part of the year. In the dry bed of the winter torrent the following plants occur abundantly: tufted-leaved Euphorbias and Kleinias, the white-flowered *Eupatorium adenophorum*, so common in Madeira, *Rumex Lunaria*, a large-leaved *Hypericum*, a *Micromeria* and the common tropical weed, *Bidens pilosa*. A good deal of the bottom of the barranco had formerly been under cultivation, and was now overrun with a yellow-flowered crucifer, *Hirschfeldia adpressa*.

The first specimens of *Pinus canariensis* were seen in the middle part of the barranco, where they descend much nearer the sea than on the ridges. In former times the pines probably extended in many places down to the coast. A small prickly-fruited umbellifer was very abundant on flat ground above the dry bed of the torrent.

We ascended the steep southern slope of the barranco, and returned to the town by the high ground. A pretty much-branched *Sempervivum* grew on the slope. It had white flowers with pink carpels, and a strong smell of honey.

Two days, June 2nd and 3rd, were spent in exploring the lovely Barranco del Rio, which runs into the mountains to the west of the town. On the way we passed the Alameda, a rectangular promenade surrounded by a wall, and shaded by about 30 trees of *Ficus nitida* in four rows, and a few Casuarinas at the far end. Some of the fig trees were blown down in a storm a few years ago and broke down a large part of the wall.

Just past the Alameda is a stone ship, which is rigged in April every fifth year, on the occasion of the festival of the Virgen de las Nieves. The church of that name is situated about one hour's walk up the barranco, and contains an ancient and much venerated image which is carried down to the town in procession during the festival. The altar is overlaid with beaten silver work, among the subjects represented on the panels being a palm, a pine tree, an olive-tree, a banana plant, a tower and a fountain.

The last house passed before entering the Barranco del Rio is situated at about 1000 ft. above sea-level on the ridge to the north, and belongs to Señor Antonio Lopez Anca, who received us very kindly, and made arrangements for a guide to accompany us on the second day.

Señor Anca cultivates a certain amount of coffee for which he obtains 2 pesetas (about 1*s.* 6*d.*) per lb., whilst Venezuelan coffee realises only $1\frac{1}{2}$ pesetas in the island.

The path follows a small aqueduct which has been built along the steep and sometimes precipitous side of the ravine, and one has to walk on the small outer wall, which in places is only 1 ft. wide.

The Barranco del Rio is much moister than the Barranco del Carmen, and the vegetation is very luxuriant. The Canary pine is extremely abundant and extends in places from top to bottom of the slopes. The precipitous rock-faces bear a characteristic association composed largely of *Sempervivum*, and including arborescent Sonchi, Cinerarias and other Compositae, *Phyllis Nobla*, *Sisymbrium millefolium* and a small-flowered *Echium*.

In the damper situations there was a great deal of a pale magenta *Cineraria* which had been much eaten by goats. By the side of the

aqueduct were several small species of *Sempervivum*, abundance of the golden-flowered *Sisymbrium millefolium*, *Arabis albida*, maiden-hair fern and a *Myosotis*.

Among the commonest shrubs and small trees are the Faya (*Myrica Faya*), the small-leaved holly (*Ilex canariensis*) and the tree-heath. There are three kinds of laurels, the most frequent being the Viñátigo (*Phoebe indica*). Among the less common trees are *Visnea mocanera*, *Catha cassinoides* and *Notelaea excelsa*.

We penetrated the ravine to a short distance beyond a hill named Lomo Corto, 2200 ft., and had a fine view of the cliffs known as La Subaquera.

On June 4th we started at 5 a.m. for the Pico del Cedro, 7300 ft. Most of the ascent was done on mule-back, but it was necessary to walk down the greater part of the way. A great extent of low wood was traversed which reached its fullest development between 3000 and 4000 ft., in the cloud belt. The wood was composed mainly of *Myrica Faya*, *Erica arborea* and *Ilex canariensis*, with undergrowth of white-flowered *Cistus* and bracken. The *Ilex* apparently did not occur above 4000 ft., but the *Myrica* was abundant up to 4400 ft., and odd specimens were seen up to 5400 ft. At 8 o'clock we reached the Llano de las Vacas, and had a fine view of the Peak of Tenerife and the wall of cliffs which encircles it above a sea of clouds. About 4700 ft. the vegetation consisted chiefly of pines, tree-heaths and bracken. The upper ridges were clothed with pine woods practically destitute of ground vegetation.

Lunch was taken at the Pozos de la Nieve, 6400 ft., small pits in which snow is stored for summer use. The mules were left here, and the rest of the ascent was done on foot. The last pines occur about 200 ft. below the summit. Above them the chief feature of the vegetation is the Codeso (*Adenocarpus viscosus*), a large papilionaceous shrub with bright yellow flowers.

The Pico del Cedro takes its name from an old cedar (*Juniperus Cedrus*), which formerly grew among the rocks at the summit. This is now dead, but part of the trunk still remains. About 200 ft. below, on the inner slope of the crater, there is a healthy and well-grown example of the same species. It took a quarter-of-an-hour to climb down to it, as much of the surface is composed of dangerous screes, some of which end in small cliffs.

Magnificent views of the crater (Gran Caldera) were obtained. The opposite rim is about four miles away and the bottom is from 5000 to 6000 ft. below. The interior of the crater has been carved by water into an intricate series of steep ravines and bold bluffs, clad with forests of *Pinus canariensis*.

As some difficulty had been experienced in reaching plants on the cliffs, we had a large hook-knife made and mounted on the end of a long pole which proved of considerable service.

On the afternoon of June 6th we examined the vegetation of the sea-cliffs to the south of the town. The beach was composed of black volcanic sand in which nothing grew. At the base of the cliff, among loose boulders and stones which had fallen from it, were a Pellitory (*Parietaria*), *Chrysanthemum frutescens*, a

Micromeria, a much-branched shrubby *Plantago* and a purplish-flowered grass (*Pennisetum cenchroides*).

Nicotiana glauca, a slender shrub with glaucous leaves and greenish-yellow tubular flowers, was abundant amongst the rocks and also in the cuttings of the carriage road which leads round the south of the island. It is a native of South America, which has become completely naturalised in stony places near the sea in the Canaries and the Mediterranean region.

We had hoped to start on the morning of June 7th for Los Llanos, a town on the west of the island, but were prevented from leaving until the 9th. In the meantime a visit was paid to a banana plantation at an altitude of 800 ft. near the village of Las Nieves. It had been neglected, and had fallen into a bad state, but was being improved by the present owners. Two diseases were prevalent, a mould (hongo) and a red scale-insect (mangra). In order to prevent the spread of the mould the perianths were removed after the fruit had set, and the terminal part of the inflorescence, which never produces fruit, was cut off. The large red bracts covering the hands were also removed. To combat the scale-insect, the plants were painted with an emulsion of paraffin and ordinary soap, as soft soap was unobtainable.

Each banana plant in the plantation is irrigated every ten days, alternate days being devoted entirely to this work. After bearing, the stems are cut off about two feet above the ground, and are fed to oxen, the dry leaves being used for packing. Only one sucker is left to replace the old stem, the stump of which remains in the ground for a year, and is then uprooted, broken up and used as manure. The suckers take a year or more to come into bearing, and the bunch of fruit is ready for cutting about five months after the first bracts open. The bunches of bananas are packed first of all in cotton wool, then in newspaper, afterwards in straw, and finally wrapped in dry banana leaves, the whole being rammed tight before the crate is fastened up.

We left Santa Cruz for Los Llanos by the public motor on the afternoon of June 9th. The road zigzags repeatedly up the hillside behind the town until it reaches Buena Vista, 1100 ft., whence it runs straight to the south of the island. The principal crops between 1000 and 2000 ft. appeared to be onions, vines, maize and bearded wheat, and there were numerous mulberry trees and figs.

An interesting plant-association was observed at a place about 1200 ft. above sea-level, where the original vegetation had not been disturbed, bushes of *Myrica Faya* growing amongst such characteristic xerophytes as *Euphorbia obtusifolia* and *Kleinia neriifolia*.

Extensive tracts of lava were passed. These were very bare, and in many places the only plants that could be seen were the Canary pine and the shrubby dock (*Rumex Lunaria*).

Near Fuencaliente at the south of the island we were surprised to see quantities of the yellow Horned-Poppy (*Glaucium luteum*) by the side of the road, at an altitude of 2200 ft., as it is usually regarded as a strictly maritime plant.

We arrived at Los Llanos at 6 o'clock, the journey having occupied three hours. The next day, (June 10th) was occupied

mainly in making arrangements for our journey to the Caldera, but some time was spent in collecting on a lava flow near El Paso.

There are many fields of tobacco in the neighbourhood, and sugar-cane is cultivated close by at Argual. Almond trees are planted everywhere, the produce being sent to Tazacorte for export. Safflower (*Carthamus tinctorius*) is grown in almost all the cottage gardens. The florets, which are used as a dye-stuff, fetch 2 pesetas (1*s.* 6*d.*) per lb. in La Palma.

On June 11th we went on to the farm of Tenerra in the Caldera, accompanied by the Forest Guard at El Paso, Francisco Gonzalez Mendez.

The track to the Caldera leads north from Los Llanos along a small gully, and over dry stony ground to the edge of the Barranco de las Angustias, the great ravine which forms the outlet of the crater. A magnificent blue-flowered thistle (*Cynara Cardunculus*, var. *ferocissima*) occurred by the side of the track and amongst the stones cleared from the fields.

At about 1400 ft. there is a fine view of the ravine, and the path turns sharply to the north-east, rising slightly until a cross is reached marking another good view-point, La Cruz de la Viña, 1600 ft. On the opposite side of the ravine there was a great cliff at the top, with a large terrace at its base, much of which was under cultivation. Below this came a steep slope ending in another cliff which extended nearly to the bottom of the gorge.

The path descends rapidly from La Cruz de la Viña to the river-bed, 800 ft. below, and proceeds for a short distance along the dry flood-bed, before crossing the stream and mounting the opposite slope. Here we observed a number of men cutting branches of *Myrica Faya* for decoration during a fiesta. The first 1000 ft. of the ascent was extremely arduous to those on foot, and took nearly an hour under the blazing sun. After passing the farm (1900 ft.) belonging to Señor Domingo Camacho, the track was rather less steep, but we were glad to make a halt under a fig tree about 400 ft. higher up. A little further, 2400 ft., we passed some bushes of a magnificent pinkish-purple *Salvia*, which we had also observed 1500 ft. below.

At 2600 ft. there were some large rounded bushes of a tansy-like composite (*Gonospermum* sp.), covered with golden-yellow flowers. This also occurred in some quantity higher up, on the slopes of a small ravine, where it formed a distinctive feature of the vegetation.

The highest point on the track is Lomo Alto, 3800 ft., from which there is a slight descent to the farm of Tenerra, which was reached at 12 o'clock. There we were most hospitably received by the owner, Señor Odon Gonzalez Morales, and pitched our tent under a fig tree near the house.

Two days (June 12 and 13) were spent in the Caldera. On the first we went to the small farm of Taburiente, 2800 ft., and collected in the pine-woods on the way. The second day was devoted to exploring the base of the fine cliffs of El Capadero, 2600–2650 ft., where we obtained a rich harvest of plants, including the endemic *Senecio palmensis*, and some photographs of the more characteristic species.

There are five farms in the Caldera (including the Barranco de las Angustias), with a total population of 66 men, women and children. The farms are Taburiente, Tenerra, Camacho, Viña and Paredon.

In the evening after sunset at Tenerra the mists creep up from the direction of the sea into the crater, where they remain all night, retreating down the Barranco de las Angustias before daybreak. The upper level of the mists is apparently about 1000 ft. below Tenerra. The meteorological conditions inside the crater form an interesting contrast with those of the Peak of Tenerife, which is shrouded by mists during the daytime and clear at night.

Our muleteers returned for us on June 14th, and we had a pleasant ride to Los Llanos with occasional stops for collecting and photographing.

The next day one of us returned to Santa Cruz by the Cumbre Vieja, whilst the other went with the luggage by the public motor.

The journey across the Cumbre Vieja, one of the passes over the ridge which forms the backbone of the southern half of the island, was made by mule, starting at 5.30 a.m.

At about 2800 ft. there were numerous pines with an under-growth of Tagasaste, tree-heath and bracken, and low pine-woods commenced a little below 3000 ft. Where the pines had been cut down on the Loma de Andrique, about 3800 ft., the hillside was yellow with bushes of Codeso (*Adenocarpus viscosus*).

At 3850 ft. a desert of black volcanic sand and gravel was entered, parts of which were destitute of vegetation, whilst others had only a sprinkling of burnt-up annuals a few inches high. These included a sorrel, a *Silene*, a rock-rose (*Helianthemum guttatum*), a Composite, two trefoils and two or three grasses. A continuous carpet of vegetation was absent except in a few depressions into which some brown sandy soil had been washed. Towards the top of the pass the black sand was replaced by brown soil, which was covered with a scrub of tree-heath and pink *Cistus* (*C. Berthelotianus*), amongst which were a few pines.

The summit of the pass is about 4700 ft. above sea-level. On the eastern slope there is a good deal of bracken near the top, and at about 4500 ft. the first bush of Faya (*Myrica Faya*) was seen. This rapidly became more plentiful, and at 4400 ft. the track entered a low wood of Faya and tree-heath, which gradually passed into typical laurel-wood. Among the more interesting herbs seen were *Geranium anemonifolium* and *Cedronella canariensis*, the latter not in flower. Two yellow-flowered species of *Sempervivum* were very common on a wall by the side of the track. One of these is known as 'Crespinel' and its juice is used to cure sores. The track joins the road at Breña Alta, 1200 ft., and the remainder of the journey to Santa Cruz calls for no remark.

We left La Palma on the evening of June 16th, and arrived at Santa Cruz, Tenerife, the next morning. In the afternoon a small ravine behind the Hotel Pino de Oro was explored. This contained an interesting association of xerophilous plants including *Plocama pendula*, *Euphorbia canariensis*, *Kleinia neriifolia* (leafless), *Lavandula abrotanoides*, a *Micromeria* and the wide-spread *Nicotiana*

glauca. The *Plocama* is a small rubiaceous bush with long slender weeping whip-like branches and small white fruits like mistletoe berries.

Next day we started by the first tram (7 a.m.) for Laguna, and walked from there to the woods of Las Mercedes. There was a good deal of the fragrant yellow-flowered *Spartium junceum* on the way.

The track to the wood leaves the road at the village of Las Mercedes, and ascends the side of a dry hill, passing some rock dwellings on the way. These are hewn out with pick-axes, and are lime-washed inside. The Guanches, who inhabited the Canaries before the Spanish Conquest, lived mostly in caves, and the custom has persisted to the present day. The best known cave-dwellings are those of Atalaya in Grand Canary.

A fine *Sempervivum* with greenish-white flowers was fairly common on the dry stony hill-side, and there was a good deal of a shrubby plantain (*Plantago arborescens*), which formed much-branched bushes 1½ ft. high. *Daphne Gnidium* occurred both on the dry hill-side and in outlying parts of the wood.

The wood commenced at an altitude of about 2600 ft., and extended to the tops of the hills, which were about 3000 ft. high. *Prunus lusitanica* occurred in great abundance, and was in flower at the time of our visit. It has an interesting geographical distribution, being known only from Portugal, the Azores, Madeira and Tenerife. A lovely gentianaceous plant, *Ixanthus viscosus*, grew in rich soil on the shady slopes. It is a slender little-branched herb, 4-5 ft. high, with a large terminal pyramidal panicle of bright yellow flowers, and has somewhat the appearance of a *Lysimachia*. Among the climbers was the beautiful mauve-flowered *Convolvulus canariensis*, which ascends to the top of the trees, where it produces dense masses of flowers. The stems of old plants become very corky, and one that we measured was 12 inches in circumference at the base. A pretty *Senecio* (*S. appendiculatus*) with white ray and buff-coloured centre was very common in the wood. Forty-five numbers of plants were collected during the day, and photographs were taken of some of the more characteristic species.

We left for England on the evening of the following day (June 19th), and arrived at Southampton on June 27th.

Over six hundred numbers of plants were collected during the expedition, and about fifty photographs were taken. The scientific results will be published elsewhere as soon as the collection has been worked out.

In the meantime we desire to express our hearty thanks to Dr. Thomas Bond Sprague, for generous financial support, without which the expedition could not have been undertaken; to the Director, Royal Botanic Gardens, Kew, for extended leave during our stay in the Canaries; to Dr. George Victor Perez, whose admirable arrangements for our stay in Tenerife and kind assistance in many other ways conduced largely to the success of the expedition; to Messrs. Wildpret Bros., for kindly permitting their seed-collector to act as guide during our visit to Orotava; and to Don

Arturo Ballester, Chief of the Forest Department in the Canaries, and Don Jose Ruiz y Albaya, Assistant Conservator in La Palma, for their courtesy in affording us all facilities in their power during our stay in La Palma.

XLVIII.—DIAGNOSES AFRICANAE.—LV.

1451. **Pelargonium luteolum**, *N. E. Brown* [Geraniaceae-Pelargonieae]; affinis *P. rapaceo*, Jacq., sed foliis biternatim divisis et petalis 3 inferioribus porrectis subimbricatis nec conniventibus facile distinguitur.

Herba bulbosa. *Folia* 4–5, omnia radicalia; petiolus 4–6 cm. longus, glaber vel minute puberulus; lamina biternatim divisa, 1·5–3 cm. longa et lata, segmentibus ultimis 3-13 mm. longis linearibus acutis. *Pedunculi* erecti, 3–5 cm. longi, inferne 1–2-nodosi, aphylli, minutissime glanduloso-puberuli. *Umbelli* 3–5-flori, basi bracteis 1 mm. longis linearibus apice barbatis involucrati. *Calyx* glanduloso-puberulus; tubus sessilis, 1·3–1·4 cm. longus; lobi 5 mm. longi, lineari-oblongi, acuti, 4 inferiores reflexi, pallide virides. *Petala* 1 cm. longa, spatulata, obtusa, 2 superiora 3 mm. lata, erecto-reflexa, 3 inferiora 4·5 mm. lata, porrecta, subimbricata, omnia pallide flava, basi lineis duobis rubris ornata. *Stamina* perfecta 5; antherae purpureae, polline aurantiaco.

South Africa. Prince Albert Div.; near Prince Albert, *Pearson*.

Described from a living plant sent in 1912 by Prof. Pearson to Kew, where it flowered in June, 1913.

The three lower petals of the flower are horizontally directed forward and the two lateral partly overlap the central one, but stand slightly above it on another plane.

1452. **Bersama transvaalensis**, *Turrill* [Melianthaceae-Melianthеae]; *B. Tysonianae*, Oliver, affinis, sed foliolis paucioribus majoribus, racemis longioribus, fructibus dense et obtuse echinatis facile distinguenda.

Arbor 12-metralis (ex *Thorncroft*), ramis teretibus juventute leviter puberulis, foliorum cicatricibus prominentibus triangularibus. *Folia* imparipinnata, usque ad 20 cm. longa, petiolo 2–4 cm. longo cum rhachi leviter puberulo plus minusve sulcato haud alato; foliola 7–9, ovato- vel elliptico-lanceolata, apice obtusa vel acutiuscula, basi lateralia oblique acuta, terminalia cuneata, margine integra vel leviter et irregulariter dentata, glabra vel costa infra leviter puberula, nervis reticulatis, lateralibus utrinque usque ad 13 cum costa in pagina superiore subprominulis in inferiore prominentibus; foliolorum lateralium petioluli 2 mm. longi, terminalium 5 mm. longi, leviter puberuli; stipulae parvae, intrapetiolares, amplexicaules. *Racemi* multiflori, terminales, 2–3-aggregati, cum pedunculo usque ad 18 cm. longi, dense puberuli; pedunculus usque ad 4 cm. longus; bracteae lineari-lanceolatae, acutae, 4 mm. longae, dense puberulae; pedicelli 4–5 mm. longi. *Calyx* extra dense puberulus, intus fere glaber, coriaceus, lobis 5, postico anguste ovato 5 mm. longo 3 mm. lato, lateralibus linearibus 5 mm. longis

1·5 mm. latis, antico ovato 5 mm. longo 4 mm. lato apice leviter bifido. *Petala* 5, inter se aequalia, recurva, oblongo- vel spathulato-linearia, apice obtusa, usque ad 1 cm. longa et 3 mm. lata, in pagina utraque unguis parte inferiore excepta puberula. *Stamina* 4, filamentis 8 mm. longis inferne latioribus complanatis et puberulis superne subulatis et glabris, antheris 1·5 mm. longis. *Discus* posticus, 1 mm. altus, truncatus, glaber. *Gynoecium* leviter obliquum, 8 mm. altum, 1·5 mm. diametro, adpresse pilosum ; stigma globosum, fere 1 mm. diametro. *Fructus* globosus, 2·5 cm. diametro, valvis dorso dense echinatis, processubus triangularibus obtusis.

South Africa : Transvaal, Saddelback Mountain, near Barberton, *Thorncroft* 817.

1453. **Crassula erosula**, *N. E. Brown* [Crassulaceae]; affinis *C. canescenti*, R. & S., sed foliis glabris eciliatis facile distinguitur.

Herba perennis, succulenta, subacaulis vel in cultura internodiis 0·4-2·4 cm. longis. *Folia* opposita, decussata, arcte approximata, patula, carnosa, 1·3–3·5 cm. longa, 7–9 mm. lata, 2·5–7 mm. crassa vel in culturis 2–6 cm. longa, 5–8 mm. lata et 2–5 mm. crassa, sessilia, basi leviter connata, subobovata, lanceolata vel lineari-lanceolata, acuta vel subobtusa, supra plana vel leviter convexa, subtus valde convexa, minute impresso-punctata, glabra, absque ciliis, viridia nec glauca. *Pedunculus* usque ad 21 cm. altus, bractearum sterilium 4 paribus instructus, inferne glaber, ad apicem minutissime puberulus. *Flores* sessiles, in cymas capituliformes 0·8–1 cm. diametro axillares et terminales sessiles vel breviter pedunculatas dense congesti. *Bracteae* folia reducta simulantes, 4–8 mm. longae, lanceolatae, acutae, superiores minutissime subpuberulae. *Sepala* 2·5 mm. longa, lineari-oblonga, subacuta, minute puberula, ciliata, viridia. *Petala* conniventi-erecta, basi breviter connata, 3·5 mm. longa, 1·5–1·8 mm. lata, imbricata, obovata, obtusa, minutissime eroso-denticulata, dorso pone apicem apiculo oblongo crasso-carnoso obtuso instructa, glabra, alba. *Stamina* inclusa, glabra ; filamenta alba ; antherae luteae. *Glandulae hypogynae* cuneatae, truncatae, aurantiacae. *Carpella* lanceolata, in stylum brevissimum attenuata, glabra.

South Africa. Little Namaqualand ; on gravel slopes in Doornpoort Ravine, *Pearson* 6153.

Described from a living plant collected by Prof. Pearson during the Percy Sladen Memorial Expedition to the Orange River in 1910–11 and sent by him to Kew, where it flowered in March, 1912.

1454. **Cotyledon glandulosa**, *N. E. Brown* [Crassulaceae]; affinis *C. glutinosae*, Schönl., sed foliis duplo brevioribus et latioribus subteretibus conspicue mucronatis et pilis minutis glanduloso-capitatis obtectis differt.

Herba perennis, succulenta, ubique (praeter partem corollae interiorem) pilis minutis glanduloso-capitatis conspersa. *Caules* erecti, 4–6 cm. alti, basi vel superne ramosi, 2–3 mm. crassi, apice foliiferi, inferne nudi, brunnei vel rubro-tincti. *Folia* opposita, in paria 3–4 conferta, sessilia, 1–2·5 cm. longa, 5–7 mm. lata, 3-6 mm. crassa, subteretia vel passim clavata, obtusa vel subacuta, distinctissime

mucronata, basi brevissime cuneata vel interdum sublonge attenuata, primum glauco-albida, demum olivaceo-brunnea, apice rubro-marginata. *Pedunculus* terminalis, erectus, 6 cm. longus, 1·5 mm. crassus, apice cymose 4–5-florus. *Bracteae* minutae, caducae. *Pedicelli* 6–7 mm. longi, recurvo-patuli. *Flores* subnutantes. *Calyx* 3 mm. longus, profunde 5-lobus, viridis, rubro-punctatus ; lobi 2 mm. longi et lati, deltoideo-ovati, acuti, subpatuli. *Corollae* tubus 5·5 mm. longus et diametro, cylindricus, sordide viridis, rubro-striato-punctatus ; lobi 1 cm. longi, 3·5–3·75 mm. lati, lanceolati, acuti, recurvo-patentes, extra sordide rubri, intra sordide virides, marginibus sordide rubris. *Stamina* 7–7·5 mm. longa, exserta, glabra ; filamenta filiformia, pallide viridia ; antherae fuscae. *Styli* 5, stamina excedentes, demum recurvi, pallide virides. *Squamae hypogynae* minutae, transverse rectangulares.

Tropical Africa. Northern Rhodesia? without locality, *G. Simpson-Hayward.*

The native habitat of this species is somewhat doubtful. It was among a collection of living plants which were collected by Mr. G. Simpson-Hayward during a cricketing tour in Rhodesia and South Africa and presented by him in 1910 to Kew, where it flowered in June, 1913. Mr. Simpson-Hayward does not remember where he found it, but informs us that "most of the plants were collected in Northern Rhodesia." The species to which it is most nearly allied is, however, a South African plant.

1455. **Hyobanche robusta,** *Schönland* [Scrophulariaceae-Gerardieae]; affinis *H. sanguineae*, Thunb., sed elatior, sepalo postico libero, corolla subduplo longiore apice acutiore et ore majore bene distinguitur.

Herba parasitica. *Caulis* usque ad 23 cm. longus, 2·5 cm. crassus, carnosus. *Folia* squamiformia, dense imbricata ; inferiora 5–7 mm. longa, orbiculari-ovata, abrupte acuta, carinata, subglabra, fusco-ferruginea ; superiora gradatim longiora, usque ad 3 cm. longa et 1·2 cm. lata, oblonga vel elongato-oblonga, acuta vel obtusa, villoso-tomentosa, dorso ferruginea, cetera albida. *Spica* usque ad 14 cm. longa et 8 cm. lata. *Bracteae* 2–3 cm. longae, 1–1·2 cm. latae, oblongae, obtusae, villoso-tomentosae. *Bracteolae* 2–2·3 cm. longae, 1·5–2 mm. latae, lineares, acutae, villoso-tomentosae, albae. *Sepala* 4–5 cm. longa, villoso-tomentosa, alba ; lateralia per paria ad medium connata, parte connata oblonga 7 mm. lata, parte libera lineari obtusa ; sepalum posticum liberum, lineare. *Corolla* 6 cm. longa, superne 7–8 mm. diametro, procurva, apice subacuta, ore obliquo 2 cm. longo basi unidentato, extra villoso-tomentosa, intra glabra, basi luteola, superne purpurea, apice ferruginea. *Stamina* vix exserta ; filamenta basi pubescentia ; antherae luteo-brunneae. *Ovarium* globosum, glabrum ; stylus apice decurvus, complanato-subclavatus.

South Africa. Humansdorp Div. ; near Humansdorp, *Mrs. Christy* 54.

1456. **Sarcostemma Pearsonii,** *N. E. Brown* [Asclepiadaceae-Cynancheae]; affinis *S. viminali*, R. Br., sed floribus minoribus, petalis angustioribus contortis luteis et corona omnino diversa differt.

Frutex succulentus, aphyllus, usque ad 30 cm. altus, furcato-ramosus. *Rami* suberecti, teretes, 3–4 mm. crassi, internodiis 2·5–5·5 cm. longis, novellis pilis minutis deciduis puberulis. *Folia* rudimentaria, vix 1 mm. longa, squamiformia, deltoidea, acuta. *Umbellae* terminales, 3–6-florae. *Pedicelli* 3–5 mm. longi, minute puberuli. *Sepala* 2 mm. longa, ovato-lanceolata, acuta, minute puberula. *Petala* 5·5 mm. longa, basi abrupte dilatata et 2·5 mm. lata, superne linearia, obtusa, 1·3 mm. lata, contorta, glabra, lutea. *Coronae exterioris* lobi lateribus loborum coronae interioris connexi, breves, poculiformes, bidentati, glabri. *Coronae interioris* lobi 1 mm. longi, suberecti, deltoideo-ovati, acuti, dorso transverse gibbosi, apice breviter bifido styli breviores.

South Africa. Great Namaqualand: Great Karasberg Range; on stony plains south-west of Krai Kluft, 1600 m. alt. *Pearson* 8460.

1457. **Xysmalobium Stocksii**, *N. E. Brown* [Asclepiadaceae-Cynancheae]; affinis *X. Heudelotiano*, Decne., sed foliis linearilanceolatis acutis duplo longioribus, floribus majoribus, coronae lobis lanceolatis facie interiore gibboso-carinatis (nec cornibus instructis) differt.

Herba perennis. *Radix* tuberosa. *Caulis* erectus, 45–55 cm. altus, simplex, unifariam puberulus. *Folia* opposita, sessilia, inferiora 12–16 cm. longa, 0·7–1·1 cm. lata, superiora gradatim minora, lineari-lanceolata, acuta, basi angustata, glabra. *Umbellae* omnes sessiles, 4–7-florae. *Pedicelli* 0·8–1·2 cm. longi, unifariam puberuli. *Sepala* 4–6 mm. longa, anguste lanceolata, acuminata, glabra. *Corolla* reflexa, fere ad basin 5-loba, utrinque glabra; lobi 5–6 mm. longi, 2·5–3 mm. lati, ovati vel elliptico-lanceolati, acuti, albovirentes (?). *Coronae* lobi 3 mm. longi, fere 1·5 mm. lati, erecto-patuli, lanceolati, obtusi, dorso subplani vel leviter convexi facie interiore prope apicem gibboso-carinati, purpurascentes.

Tropical Africa. Portuguese East Africa; without precise locality, *Stocks*.

1458. **Ceropegia Dalzielii**, *N. E. Brown* [Asclepiadaceae-Ceropegieae]; affinis *C. campanulatae*, Don, sed foliorum marginibus costisque glabris et floribus fere duplo majoribus differt.

Herba perennis, tuberosa. *Tuber* parvum, subglobosum vel ovoideo-discoideum. *Caulis* erectus, simplex, circa 36 cm. altus, 2 mm. crassus, tenuiter et minute puberulus. *Folia* superiora 5–8 cm. longa, 2–3 mm. lata, linearia, acuta, inferiora gradatim minora, glabra. *Flores* pauci, solitarii, ad nodos laterales et terminales, erecti. *Pedunculi* 1·5 cm. longi, puberuli. *Sepala* 4–5 mm. longa, attenuato-subulata, subpuberula. *Corollae* tubus rectus, 4 cm. longus, basi inflatus, medio cylindricus, apice late infundibuliformis et circa 2 cm. diametro, extra glaber, inferne purpureus, superne virescens; lobi 4 cm. longi, erecti, leviter incurvati et apice connati, e basi late deltoidei anguste lineares, replicati, intra sublanato-pilosi, virides vel olivaceo-virides ut videtur.

Tropical Africa. Northern Nigeria: at Abinsi, only a single specimen found, June 15, 1912, *Dalziel* 689.

Neither the interior of the corolla-tube nor the corona of this species can be described, as the only flower upon the specimen has been so much flattened in pressing that it will not admit of examination.

1459. **Ceropegia Patersoniae**, *N. E. Brown* [Asclepiadaceae-Ceropegieae]; affinis *C. Zeyheri*, Schlechter, sed floribus solitariis multo longioribus et corollae tubo glabro differt.

Caulis succulentus, volubilis, 3 mm. crassus, glaber. *Folia* perparva, sessilia, patula, 4–8 mm. longa, 1·5–2 mm. lata, lanceolata, acuta, glabra, succulenta. *Flores* ad nodos laterales, solitarii. *Pedicelli* 6–8 mm. longi, 1·5 mm. crassi, glabri. *Sepala* 5 mm. longa, lanceolato-attenuata, glabra. *Corollae* tubus 2·2–2·5 cm. longus, basi inflatus, extra intraque glaber, basi intra purpureo-punctatus; lobi 2–2·3 cm. longi, erecti, leviter curvati (?), apice connati, lineari-filiformes, basi utrinque breviter villoso-pubescentes, superne intra minute pubescentes. *Coronae exterioris* lobi fere ad basin bifidi, glabri, segmentis 2 mm. longis subulatis erectis. *Coronae interioris* lobi erecto-conniventes, 2·5 mm. longi, lineares, glabri.

South Africa. Uitenhage Div.; near Redhouse, *Mrs. T. V. Paterson* 210.

Described from a specimen preserved in fluid, received from Dr. S. Schönland in July 1913.

1460. **Ceropegia Schoenlandii**, *N. E. Brown* [Asclepiadaceae-Ceropegieae]; affinis *C. barbertonensi*, N. E. Br., sed petiolis brevioribus, floribus multo minoribus et corollae tubo intra glabro facile distinguitur.

Caulis volubilis, tenuis, 1 mm. crassus, glaber. *Folia* carnosa, subrigida, glabra; petiolus 3-4 mm. longus; lamina 1·2–1·6 cm. longa, 0·9–1·3 cm. lata, ovato-cordata, obtusa, apiculata, subundulata, glabra. *Pedunculi* ad nodos laterales, 1·3–2 cm. longi, demum pluriflori, glabri. *Pedicelli* 3–4 mm. longi, glabri. *Sepala* 1·5 mm. longa, subulata, acuta, glabra. *Corollae* tubus 1·2 cm. longus, vix curvatus, extra intraque omnino glaber, basi globoso-inflatus et purpurascens, supra pallidus, ore leviter dilatato et 4 mm. diametro; lobi erecti, recti, apice connati, 5 mm. longi, late lineares, apice vix vel levissime dilatati, marginibus replicatis, extra glabri, intra pilis tenuissimis purpureis conspersi. *Corona* exterior brevissima, lobis quinque poculiformibus emarginatis, glabra, alba. *Coronae interioris* lobi 1–1·25 mm. longi, conniventi-erecti, apice leviter recurvati, lanceolati, acuti, basi angustati, glabri, albi.

South Africa. Uitenhage Div.; near Redhouse, *Mrs. T. V. Paterson.*

Described from a specimen preserved in fluid, received from Dr. S. Schönland in July 1913.

1461. **Stapelia longipedicellata**, *N. E. Brown* [Asclepiadaceae-Stapelieae]; affinis *S. kwebensi*, N. E. Br., sed pedicellis erectis duplo vel triplo longioribus, corolla minus rugosa et atrata differt.

Caules conferti, erecti (nec basi decumbentes), 10–15 cm. longi, 1–1·5 cm. crassi, tetragoni, minute puberuli, virides; anguli dentati. *Folia* rudimentaria, erecta, lanceolato-subulata, acuta. *Cymae* ex. medio caulorum enatae, 2–4-florae, pedunculatae. *Pedunculi* 8–12, mm. longi, 6 mm. crassi, minute puberuli. *Pedicelli* erecti, 2·5–5 cm. longi, 3 mm. crassi, minute puberuli. *Sepala* patula, 6–7 mm. longa, subulato-lanceolata. *Corolla* 3·8–4·3 cm. diametro, profunde 5-loba extra minutissime puberula; tubus parvus, circa 3 mm. longus

6 mm. diametro, glaber, subpurpureus ; lobi stellatim patentes, 1·6–1·9 cm. longi, 7 mm. lati, quum explanati lanceolati, acuti, convexi, marginibus valde revolutis, intra transversim rugosi, basi glabri, cetera puberuli, subnigri. *Coronae exterioris* lobi minuti, brevissimi, 0·5 mm. longi, 1·5 mm. lati, truncati. *Coronae interioris* lobi lineares, obtusi, antheris incumbentes et eas vix excedentes, sordide purpurei. —*S. kwebensis* var. *longipedicellata*, Berger, Stapelieen und Kleinien, p. 318, fig. 66.

Tropical Africa. German South West Africa, described from a living plant, which flowered at Kew in September, 1912.

This plant was received from Messrs. Haage & Schmidt under the name of *S. kwebensis*, and is undoubtedly the variety *longipedicellata* of Berger. But it distinctly differs from *S. kwebensis* by the more minute pubescence of the stems, much smaller rudimentary leaves, long stout peduncles, the twice as long and erect (not spreading) pedicels and different colour of the flowers. It also comes from a different area.

1462. **Stapelia Pearsonii**, *N. E. Brown* [Asclepiadaceae-Stapelieae]; affinis *S. olivaceae*, N. E. Br., sed pedicellis triplo vel quadruplo longioribus et corolla eciliata subtiliter rugosa facile distinguitur.

Caules erecti, 4–8 cm. longi, 0·6–1·2 cm. crassi, obtuse 4-angulati, lateribus planis vel leviter concavis, minute puberuli, sordide virides vel cinereo-virides, purpureo-brunneo-marmorati ; anguli rotundati, haud compressi, vix vel haud dentati. *Folia* rudimentaria, 0·75–1 mm. longa, deltoidea, acuta, erecta. *Pedicelli* 2·5–3·5 cm. longi, minute puberuli, purpurascentes. *Sepala* 3–4 mm. longa, anguste deltoideo-lanceolata, acuta, minute puberula. *Corolla* 3·5 cm. diametro, extra minute puberula, sordide virescens, lobis nervis 3 purpureis ornata, intra glabra, subtiliter rugosa, omnino brunneo-purpurea ; discus subplanus, 1·2 cm. diametro ; lobi stellatim patuli, 1·4 cm. longi, 6–8 mm. lati, lanceolati, acuti, convexi, marginibus recurvis eciliatis. *Coronae exterioris* lobi 4 mm. longi, anguste lineares, obtusi vel acuti, plani, in disco corollae patuli, fusco-purpurei, plus minusve nitidi. *Coronae interioris* lobi bicornuti, fusco-purpurei ; cornua filiformia, exteriora 2·5 mm. longa, recurva, interiora 4 mm. longa, basi conniventia, apicibus recurva.

South Africa. Great Namaqualand ; on the Great Karasberg range, among rocks above the camel-path between Narudas Sud and Krai Kluft, 1450–1500 m., *Pearson* 8539.

This species, *S. olivacea*, N. E. Br., and *S. similis*, N. E. Br., so closely resemble one another in their stems and in habit, that when out of flower they are very difficult to discriminate, yet the flowers of all three are quite different.

1463. **Euphorbia Hislopii**, *N. E. Brown* [Euphorbiaceae-Euphorbieae]; species *E. splendenti*, Bojer, simillima, sed caulibus fere duplo crassioribus, foliis sessilibus basi late cuneatis nec attenuatis et pedunculis brevioribus facile distinguitur.

Frutex succulentus, spinosus. *Caules* vel rami (spinis exclusis) 2–2·5 cm. crassi, 8-angulares, glabri, olivaceo-virides vel cinereo-olivacei ; anguli grosse spinoso-dentati, spinis 0·5–1·5 cm. longis brunneis. *Folia* sessilia, 5–9 cm. longa, 1·8–4 cm. lata, lanceolato-oblonga vel anguste elliptica, obtusa vel acuta, basi late cuneata,

glabra, viridia. *Cymae* ad apicem ramorum subsolitariae erectae; pedunculi 1–1·5 cm. longi, 2·3–2·5 mm. crassi. *Bracteae* squamiformes, 2–3 mm. longae, subquadratae vel oblongae, obtusissimae, membranaceae; bracteae florentes 5–6 mm. longae, 0·8–1 cm. latae, transversim ellipticae, obtusissime rotundatae, minute apiculatae, glabrae, pulchre coccineae. *Involucrum* 3·5–4 mm. diametro, campanulatum, glabrum, glandulis 5 transverse ellipticis coccineo-rubris. *Ovarium* breviter stipitatum, inclusum, glabrum; styli e basi liberi, filiformes, 2·5 mm. longi, rubro-coccinei, apice clavati, atro-fusci.

Origin unknown, but probably a native of Madagascar or neighbouring islands, since the species most nearly allied to it all come from there. The above description is made from a plant cultivated at Kew, raised from a cutting brought from the Botanic Garden at Durban by *Mr. A. Hislop* in 1911.

1464. **Anchomanes Dalzielii**, *N. E. Brown* [Aroideae-Pythonieae]; affinis *A. Welwitschii*, Rendle, sed spadice multo longiore et ovario laevi in stylum brevem abrupte contracto differt.

Herba tuberosa. *Folium* solitarium; petiolus 0·6–1 m. longus, spinosus; lamina triramosa; rami 20–38 cm. longi, 15–45 cm. lati, ad medium furcati, pinnatisecti, glabri, segmentis inferioribus late ovatis vel obliquis acutis vel acuminatis terminalibus cuneatis vel cuneato-oblongis bicuspidatis. *Pedunculi* elongati, spinosi. *Spatha* 20–22 cm. longa, basi convoluta, superne concavo-lanceolata, acuta, glabra, alba. *Spadix* 13–15 cm. longus, 1·5 cm. crassus, cylindricus, obtusus, parte feminea 2–3 cm. longa. *Ovarium* oblongum vel obovato-oblongum, apice subtruncatum, in stylum 1 mm. longum abrupte contractum, laeve.

Tropical Africa. Northern Nigeria; Kontagora Province, *Dalziel* 563.

1465. **Gladiolus Masoniorum**, *C. H. Wright* [Iridaceae-Ixieae]; ex affinitate *G. sulphurei*, de Graaf, a qua lobis perianthii brevioribus spathisque acuminatis differt.

Folia 5·3 dm. longa, 1 cm. lata, basi apiceque attenuata, utrinque hirsuta, costa crassa, nervis marginalibus validis. *Racemus* 30 cm. longus, glaber; spathae herbaceae, glabrae, exterior lanceolata, acuminata, 3·5 cm. longa, 1·2 cm. lata, interior minor, 3 cm. longa. *Perianthium* cremeum, ad faucem pallide luteum, intra tubum viride; tubus 2 cm. longus, anguste infundibuliformis; lobi 5 superiores subaequales, 3 cm. longi, 2 cm. lati, obtusi, undulati; lobus inferior 1·5 cm. latus. *Antherae* cremeae. *Stigmatis* lobi spatulati, 3 mm. longi.

South Africa. Described from a plant which flowered in the Cambridge University Botanic Garden in May, 1913, from material collected in Tembuland by *Canon G. E.* and *Miss M. H. Mason.*

1466. **Moraea revoluta**, *C. H. Wright* [Iridaceae-Moraeeae]; *M. spathaceae*, Ker, affinis, floribus solitariis, sepalis revolutis stylique cristis differt.

Cormus 2·5 cm. diametro, tunicis brunneis reticulatis vestitus. *Caulis* lateralis. *Folia* circa 3, 7·5 dm. longa, 1 cm. lata, rigida, crassiuscula, glabra, acuminata, convexa, anguste canaliculata.

Scapus 35 cm. altus, cylindricus ; spathae valvae 10 cm. longae, acuminatae, rubro-brunneae tinctae ; pedicelli 9 cm. longi. *Sepala* 5·5 cm. longa, 1·2 cm. lata, oblonga, obtusa, revoluta, extus brunneo-purpurea tincta, intus in parte superiore lineis divergentibus brunneis vittata. *Petala* oblanceolata, obtusa, 6 cm. longa, 1·2 cm. lata, lucide lutea. *Antherae* luteae. *Styli* rami 3·5 cm. longi, lutei, brunneo-tincti ; cristae 2 cm. longae, alte bipartitae, irregulariter undulatae, lobis subcruciatim impositis. *Ovarium* glabrum, oblongum, rubro-brunneum, 3 cm. longum, 4 mm. diametro.

Tropical Africa. Angola, at the top of ridges in dry soil. The corms were collected in Angola and sent to Kew by *Mrs. F. Douglas Fox*. They flowered in August, 1913.

The crossing of the style-crests, like the tips of the closed wings of some birds, forms a characteristic feature of the flower.

1467. **Sansevieria bagamoyensis**, *N. E. Brown* [Liliaceae-Dracaeneae] ; species distinctissima, fruticosa vel suffruticosa, caulibus erectis foliis quoquoversis recurvato-patulis et floribus paniculatis.

Frutex vel *suffrutex*, caulibus erectis folosis. *Folia* quoquoversa, recurvato-patula, 17–38 cm. longa, usque ad 1·3 cm. lata, linearia vel lineari-lanceolata, attenuato-acuta, concavo-canaliculata, angustissime rubromarginata. *Panicula* 40 cm. longa et 25 cm. diametro, ramis 6·5–20 cm. longis. *Fasciculi* 2–4-flori. *Pedicelli* in fructu 5 mm. longi, medio articulati. *Flores* parvi ; tubus 5 mm. longus, angustus ; lobi 6 mm. longi, lineares.

Tropical Africa. German East Africa ; near Bagamoyo, *Sacleux* 672.

1468. **Sansevieria abyssinica**, *N. E. Brown* [Liliaceae-Dracaencae] ; affinis *S. metallicae*, Gér. et Labr., sed foliis crassioribus rubromarginatis epidermide rugosa facile distinguitur.

Herba succulenta, acaulis. *Folia* 60 cm. vel ultra longa, 6–7·5 cm. lata, lanceolata, acuta, basi in petiolum concavo-canaliculatum attenuata ; epidermis minute sed distinctissime rugosa. *Racemus* cum pedunculo 67–75 cm. longus. *Fasciculi* 4–5-flori. *Pedicelli* in fructu 6–8 mm. longi, medio articulati. *Flores* non vidi. *Baccae* 0·7–1·3 cm. diametro.

Abyssinia. On mountains near Jana, 1300–1500 m., *Schimper* 1468.

1469. **Sansevieria conspicua**, *N. E. Brown* [Liliaceae-Dracaeneae] ; affinis *S. Dawei*, Stapf, sed foliis brevioribus subsessilibus et floribus multo majoribus differt.

Herba acaulis. *Folia* 3–5 in fasciculum aggregata, 22–60 cm. longa, 5–8 cm. lata, lanceolata, acuta, apice indurata, basi angustata, vix petiolata, utrinque viridia, supra atro-lineata, subtus obscure fasciata, marginibus rufo-brunneis. *Inflorescentia* racemosa, 45–50 cm. alta. *Flores* fasciculati. *Fasciculi* 2–3-flori. *Pedicelli* 4–6 mm. longi, apice articulati. *Perianthii* tubus 3·8–4·2 cm. longus, lobi 2·5–3·1 cm. longi, lineares, obtusi, albi.

British East Africa. Near Mazeras, *Powell* 12.

Described from a living plant, sent by Mr. H. Powell in 1906 to the Royal Botanic Gardens, Kew, where it flowered in Sept. 1909. According to Mr. Powell the plant is scarce.

1470. **Lipocarpha monocephala**, *Turrill* [Cyperaceae-Scirpoideae]; a speciebus omnibus adhuc descriptis spicis solitariis differt.

Herba annua, glabra, gracilis, usque ad 11 cm. alta. *Culmi* plures, teretes, laeves, inferne foliati, superne nudi. *Folia* linearia, acuta, 1–2 cm. longa, 0·5 mm. lata. *Spicae* solitariae, laterales, 4–6 mm. infra apicem positae, breviter conoideo-cylindricae, 2·5 mm. longae, 1·5 mm. diametro. *Glumae* late triangulares, apice minute apiculatae, 0·75 mm. longae, 0·75 mm. latae, costa alba excepta atrorubentes, glabrae. *Squamellae* 2, antice et postice dispositae, apice rotundatae vel obtusae, 0·75 mm. longae, 0·5 mm. latae, hyalinae. *Stamen* 1, anticum; filamentum 0·75 mm. longum; anthera conspicue apiculata, cum apiculo ei vix aequilongo fere 0·5 mm. longa. *Nux* obovoidea, 0·75 mm. longa, fere 0·5 mm. diametro, brunnea, laevis; stylus 0·4 mm. longus, profunde bifidus.

Tropical Africa. S. Rhodesia; Victoria Falls in the Rain Forest, *F. A. Rogers* 6024.

XLIX.—A DISEASE OF NARCISSUS BULBS.

(With Plate.)

G. Massee.

About three years ago a disease of an unusual nature was met with on various kinds of Narcissus bulbs. During the present season the disease has increased to such a serious extent, that according to the statement of growers on a large scale, entire plots of bulbs have been completely destroyed. The injury is due to the presence of a parasitic fungus called *Fusarium bulbigenum*, Cooke & Mass., first described in 1887, the host being given as a Narcissus bulb. At that time it was not recognised as a parasite.

As a rule the presence of the parasite is first indicated by the appearance of small, yellowish spots on the leaves. These spots gradually increase in size, become brown and dry, and become more or less covered with pale salmon-coloured specks, which are at first more or less gelatinous, but soon become dry and horny when exposed to the air. These coloured patches are masses of Fusarium spores, which are dispersed by various means and infect neighbouring plants. The mycelium present in the leaf can be traced passing downwards into the bulb, where it grows vigorously and spreads rapidly in the fleshy bulb-scales. During the early stage of infection of the bulb, the tips of the scales only are injured, as indicated by the brown colour, the injury, however, gradually extends to the base and enters the "cushion," from whence it spreads rapidly, and very soon the entire bulb is of a uniform brown colour. When this stage is reached the fungus forms delicate whitish sheets between the bulb-scales, and numerous chlamydospores or resting-spores are produced on the mycelium present in the substance of the scales. These spores are globose, colourless, with a thick cell-wall, and are produced at the tips of branches, or occur in chains in the length of the mycelium. They

vary from 10–14μ in diameter. The Fusarium spores are borne in clusters at the tips of short branches, and in the mass are tinged salmon-colour, but are colourless under the microscope, they are 3-septate, tips pointed and slightly curved. In size they vary from 40–50 × 5–6μ.

When a bulb becomes brown, it soon commences to decay, and its complete destruction is hastened by the attacks of various kinds of saprophytic fungi, *Penicillium*, &c., and by saprophytic eelworms, such as species of *Rhabdites*. When bulbs decay in this manner before lifting, as frequently happens, the soil becomes infected by the liberation of the chlamydospores, which infect future crops. The germinating chlamydospores emit one or two short slender branches, which bear a few short chains of minute, colourless, elliptical secondary-spores, measuring about 3 × 2μ. These minute spores are the first to infect Narcissus leaves in the spring, after which the disease is continued throughout the season by means of the Fusarium form of spore.

The young leaves of a Narcissus, about 1 in. long, were infected with Fusarium spores, and in six days yellowish spots appeared at the points of infection, and as the leaves continued to increase in length, other diseased spots appeared lower down the leaf, mycelium in all instances being present in abundance in the tissues a week after the infection period. It is highly probable that the first infection, by means of the minute secondary-spores produced by the chlamydospores, occurs when the leaves are quite young, and that the disease gradually descends to the base of the leaf and into the bulb, by a series of subsequent infections lower and lower down the leaf, due to independent infections by spores washed from diseased patches higher up the leaf. Chlamydospores are present in abundance in the tissues of the leaves.

The continuance of this disease may be due to two independent causes :—

(1.) Slightly diseased bulbs, containing the Fusarium spores or chlamydospores. Such bulbs are not readily detected when the injury is slight ; however, when cut in two the presence of disease is readily indicated by the browning of the scales near the neck of the bulb. It is very doubtful whether soaking slightly diseased bulbs in a fungicide would kill the mycelium present ; it certainly would not kill thick-walled chlamydospores or resting-spores.

(2.) Infected soil. Whenever a crop of diseased bulbs has occurred, it may be concluded with certainty that the soil is infected, due to the decay of bulbs before lifting, and to fallen diseased leaves, both of which contain chlamydospores in their tissues. So far as is known at present, the fungus has only been met with on Narcissus bulbs, but most probably in course of time, it will extend its ravages to other bulbous plants. Under the circumstances, the safest course would be to avoid planting bulbs for two or three years, on land that had produced a diseased crop. No kind of dressing would be likely to destroy the chlamydospores directly, but

A DISEASE OF NARCISSUS BULBS.

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during the spring, when they are germinating and producing secondary-spores, the latter would be killed by a dressing of kainit, or of sulphate of potash, lightly worked into the soil.

The disease is known in Holland, from where, quite unintentionally, the disease may often be re-introduced into this country by means of slightly infected bulbs.

Description of the Figures.

1. Section of Narcissus bulb, showing early stage of disease. Natural size.
2. Branched mycelium bearing clusters of Fusarium spores. × 400.
3. Chlamydospores or resting-spores. × 400.
4. Chlamydospores germinating and producing secondary spores. × 400.

L.—THE NATIONAL BOTANIC GARDEN OF SOUTH AFRICA.

After a lapse of over twenty-one years a Botanic Garden at the Cape is once again an established fact. The delay in the realisation of this important project is almost compensated for by the nature of the present achievement, and one need no longer regret the abandonment in 1892 of the ill-fated Cape Town Botanic Garden since a scheme for the establishment of a National Botanic Garden at Kirstenbosch is now being perfected, thoroughly worthy of a United South Africa.

The history of the founding of the original Cape Town Botanic Garden and of its transference to the Municipality has already been recorded in the pages of the *Bulletin*.* In a sense that garden has served its purpose and it has now become the pleasant and necessary public garden of the city. For a Botanic Garden the situation was undesirable and the area wholly inadequate. When to these serious drawbacks the impossible financial position is taken into consideration the existence of the Garden, botanic often little more than in name, for nearly forty-five years is a striking testimony to the pertinacity of a few devoted men actuated by a great ideal.

It must not be forgotten, however, before passing on to the consideration of the National Botanic Garden at Kirstenbosch that in Natal South Africa has possessed a Botanic Garden for over fifty years where the true functions of such an institution have been ably maintained in spite of many difficulties. It is a matter of regret that the area of this Garden is so small; but small though it be its maintenance is as important now as ever it was, and its activities must not be suffered to be curtailed or its functions abrogated owing to any change in its administration or to the establishment of the new National Garden.

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* *Kew Bulletin*, 1892, p. 11.

The need for provincial gardens like the one at Durban and for experimental botanic stations, which is now apparent and which was referred to by Professor Pearson in his presidential address before the South African Association for the Advancement of Science in 1910, will be even more keenly realised when the importance and possibilities of the National Garden come to be fully appreciated.

The choice of the Kirstenbosch Estate as the site for the National Botanic Garden was a particularly happy one and there can be no doubt that the selection of this site for the purpose would have met with the approval of Cecil Rhodes himself. The establishment of the Garden under such auspicious circumstances may therefore in large measure be regarded as an additional memorial to his wisdom and munificence.

The existence of so suitable a site for the garden as is this portion of the Rhodes Estate would, however, have been of little value but for the far-sightedness of General Botha and his Government in consequence of which the scheme has passed from the region of proposition and discussion into the realm of fact.

When the question of the establishment of a National Garden was prominently raised by Professor Pearson in 1910 proposals till then somewhat tentative and vague assumed a more definite character, and a meeting held in Cape Town on March 8th, 1912, under the presidency of Lord de Villiers, Chief Justice of South Africa, placed the matter on a practical basis. The object of the meeting was to advocate the formation of a National Botanical Society of South Africa whose ultimate aim should be the establishment of a National Botanic Garden. The resolution was moved by Professor Pearson and seconded by Dr. Marloth after the Chairman had warmly advocated the proposition in his opening remarks. Among those present were Mr. Arderne, who has frequently urged the need of an adequate Botanic Garden and to whose father the honour of the first suggestion of a Botanic Garden in 1847 is due; other representative people included Senator Schreiner, Sir Meiring Beck, the Rt. Hon. J. X. Merriman, the Mayor of Cape Town (Sir Frederick Smith), Mr. T. Bolus, Mr. E. Pillans and others.

The resolution was carried unanimously and a committee was formed to consider the formation of a National Botanical Society and to prepare the details of a scheme for the establishment of a National Botanic Garden within the peninsula.

The following were elected to serve on the committee: Lord de Villiers, Sir Meiring Beck, Mr. Pillans, Professor Pearson, Mr. Struben, Dr. Marloth, Mr. L. Mansergh, Miss Fairbridge, Mr. G. B. van Zyl, Mr. F. Cartwright, Mr. Ridley, Mr. Nash, Mr. Arderne and the Mayor of Cape Town, with power to add to their number.

A deputation representing this committee waited on the Prime Minister (General Botha) on April 4th, 1912, Mr. Malan, Minister of Education, being also present, and was sympathetically received. An estimate of the annual cost of the maintenance of a Botanic Garden and definite suggestions as to the nature of its control were asked for before any decision could be given by the Government. It was in the course of this interview that the suitability of the Kirstenbosch Estate for the purposes of a Botanic Garden was pointed out.

More than a year elapsed before the subject was further advanced. Sir Lionel Phillips, though unable to be present at the meeting held in March, 1912, had warmly espoused the cause which the advocates of a National Botanical Society had at heart and entered the field as the champion of the proposal to found a National Botanic Garden. On May 6th, 1913, he moved in the House of Assembly "that the Government should consider the advisability of setting aside a piece of ground at Kirstenbosch for the establishment of a National Botanic Garden." After an interesting debate which occupied some two hours, during which general support was given and considerable interest and enthusiasm was shown the motion was agreed to unanimously. That enthusiasm has carried the scheme to a successful issue.

The debate was followed by a deputation to the Prime Minister including members of both houses and of different political views which resulted in the formal approval of the scheme, the grant of the use of the Kirstenbosch Estate, and the placing of a vote on the supplementary estimates of the year.

The Government grant consists of £2500 for a Director's house and a small private Laboratory with an annual subsidy of £1000 a year which may be increased when plans are more definitely matured.

The establishment of a National Botanical Society to supplement the funds granted by the Government now became a necessity and on June 10th, the Mayor of Cape Town (Mr. Councillor H. Hands) presided over a large and influential meeting convened for the purpose of inaugurating the Society. Sir Lionel Phillips put the resolution to the meeting:—"That this meeting agrees to the formation of the National Botanical Society for the purpose of assisting in the establishment of a National Botanic Garden at Kirstenbosch, and for the encouragement of the growth of the South African flora." This resolution, and a further one relating to subscriptions, having been carried, Sir Lionel Phillips added that he had merely been an instrument, and that the initiative came from Professor Pearson, who would be the Honorary Director of the Garden.

The control of the Garden is to be exercised by a Board of five trustees, of whom three are nominated by Government, one by the Corporation of Cape Town, and one by the Botanical Society. Lord de Villiers, Sir David Graaff, and Sir Lionel Phillips have been appointed members of the Board by the Government, and the Mayor of Cape Town has been appointed a trustee by the Corporation.

The decision of the Government to establish the Garden having been reached, no time has been lost in putting the scheme into operation. Professor H. H. W. Pearson has been appointed Honorary Director, a position which he is admirably qualified to fill and one which could hardly be more fittingly bestowed when regard is had to the ardour and perseverance which he has displayed in helping to bring the Botanic Garden into being. Mr. J. W. Matthews, formerly at Kew (see *K. B.*, 1913, p. 278), has been appointed Curator, and work was actually commenced at Kirstenbosch on August 1st.

The following circular has been issued by the Honorary Director :—

"NATIONAL BOTANIC GARDENS, KIRSTENBOSCH, NEWLANDS, CAPE.

"August, 1913.

"Dear Sir,

"You will be aware that the formation of a National Botanic Garden has been commenced on the Groote Schuur Estates, at Kirstenbosch.

"The main objects of the Garden are the preservation, cultivation and study of the native vegetation of South Africa. To this end, it is desired to establish at Kirstenbosch a large and representative collection of native plants. The educational and scientific value of such a collection in a place where it can be easily studied, not only by the large population residing in the vicinity, but also by very numerous visitors from all parts of South Africa and from oversea, can hardly be overestimated. It is therefore felt that the success of the National Botanic Gardens will be earnestly desired by those who appreciate the fact that the native vegetation of South Africa constitutes in many respects the most remarkable of the warm-temperate floras of the world.

"It is very desirable that no time should be lost in adding to the collection of living plants already established at Kirstenbosch. I am therefore authorised by the Trustees to invite your kind co-operation, in the hope that you will be able to contribute specimens from your neighbourhood.

"In general, it may be said that any South African plants will be gratefully received. In particular, it is desired to obtain *seeds*, *bulbs*, *corms* or other parts suitable for propagation, or complete living specimens of—

1. Plants remarkable for the beauty of their foliage or flowers, or for any other peculiarity.
2. Rare plants of all kinds.
3. Succulents.
4. Plants of known or supposed economic value—especially those used in medicine.
5. Grasses.
6. Trees and shrubs.
7. Climbing plants.
8. Ferns.
9. Cycads.

"Specimens may be sent free by rail if addressed :—

'Botanical Specimens.'
O.H.M.S.
The Director,
National Botanic Gardens,
Kirstenbosch,
Newlands, Cape.

"Trusting that you will be willing to assist us,
I am, dear Sir,
Yours faithfully,
H. H. W. PEARSON,
Hon. Director.'

The circular appears to have been promptly responded to. Professor Pearson writing to Sir William Thiselton-Dyer on August 12th says "People here are really proud of their flora . . . . Now that they see work [on the Botanic Garden] really in progress they are as keen as anyone could wish. Last night I received six great packages of aloes, bulbs and other things from a firm of merchants in Grahamstown, and when the enclosed circular (printed above) has been well distributed I do not doubt we shall be all but overwhelmed with material. The movement is extremely popular and I believe its popularity will last—some indications of this are really amusing. For example I was stopped by three separate station officials yesterday, to be told of the arrival of the six packages."

There can be no doubt that Professor Pearson is correct in saying that South Africans are proud of their flora, and it is well that they should be seeing that they live surrounded by some of the most remarkable types of vegetation in the world. It would be impossible to convey any impression of its richness in a short notice and one can only point to the evergrowing pages of the *Flora Capensis* as an indication of its wealth and diversity. The long list of collectors and travellers there enumerated bears ample testimony to the interest which has been aroused by the vegetation of the Cape peninsula and South Africa generally since the discovery of the Cape of Good Hope. A visit to many a European Botanic Garden and more particularly to Kew would probably be a striking object lesson to those in South Africa who have not fully realised the value and importance of their native flora.

Now that the South African Government with far-sighted wisdom have granted a well-nigh ideal site for the proper cultivation, among other things, of the native treasures of South Africa it will be possible for plants to be seen under their own sky which up to now it might have been easier to sail to England or to visit the Riviera in order to examine.

The site granted for the garden is a farm about 400 acres in extent on the eastern slopes of Table Mountain which has been neglected for some years. Though it is largely overgrown with poplars and pines there still exist on it specimens of nearly every native tree to be found in Southern Cape Colony west of the Knysna forests. The general situation of the garden is all that could be desired since it ranges in elevation from about 60–200 ft. in the eastern to about 1500 ft. in the western half. The soil is granite below with sandstone blocks at the higher levels, strewn over the surface from above, while near one boundary there is an outcrop of Malmesbury slates. The granite occupies some 200 acres and the land is slightly undulating. In many places there are extensive deposits of rich organic soil. A feature of very great importance is the presence of permanent water and there are two constant streams which will be of the utmost value for irrigation purposes, and will no doubt also be capable of effective treatment from the scenic point of view, especially as the gorges are richly wooded with native vegetation. There is also a heavy winter rainfall and the garden is practically completely sheltered from the drying south-east wind. In addition to these highly desirable qualifications for the purposes of a garden the site also commands a magnificent view eastwards over the Cape Flats.

Not only is there a rich flora of native trees but many mesembryanthemums, aloes and other succulents are to be found growing wild at Kirstenbosch and as the climate of the Cape Peninsula is one which is favourable to the growth of succulents it will no doubt be possible to build up an almost complete collection of the remarkable succulent flora of the Karoo, Namaqualand, &c., an achievement which alone might be held to justify the establishment of a National Botanic Garden in that Peninsula. (Further details as as the site, etc., are given in the article by Professor H. H. W. Pearson in Gardeners' Chronicle, August 30th, 1913, pp. 150–152.)

The Kirstenbosch site has the further and very important advantage that it is easily accessible, being about 1½ miles from the nearest station on the railway from Cape Town to Simonstown. A good motor road, completing Rhodes' scheme of a road round Table Mountain, passes through the estate and there is already a popular service of motor omnibuses using this route as far as it is open for traffic.

It is proposed to build the residence for the Director and the small Laboratory without delay, and as the Curator is already in office and labour appears to be available for clearing purposes it only remains for the people of South Africa adequately to finance the scheme.

The site selected would appear to be as favourable as could be wished, the native flora is one unique in its botanical and horticultural interest and the opportunities for scientific work likely to be beneficial to the country at large afforded by a Botanic Garden are very great. That the Government in granting the use of the Kirstenbosch Estate and in making a grant have responded nobly to the demand for a National Garden will be generally agreed, but unless adequate popular support be forthcoming a great opportunity may easily be lost.

The National Botanical Society of South Africa has set before itself a task of great importance and one which it may justly feel proud to have had entrusted to it. The botanical world is fortunate in possessing full confidence that the task so enthusiastically undertaken will be carried to a successful fulfilment and rejoices in the formation of the Society and in the establishment of the National Botanic Garden.

LI.—MISCELLANEOUS NOTES.

Mr. Humphrey Gilbert Carter, M.B., Ch.B. (Edin.), has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, Economic Botanist to the Botanical Survey of India.

Mr. John Noel Milsum, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, an Assistant Superintendent of Government Plantations in the Federated Malay States in succession to Mr. J. G. Watson (*K. B.* 1913, p. 48) who has been transferred to the Forestry Department of the Federated Malay States.

Botanical Magazine for October.—The plants figured are *Stanhopea grandiflora*, Reichb. f. (t. 8517); *Rhododendron haematocheilum*, Craib (t. 8518); *Nautilocalyx pallidus*, Sprague (t. 8519); *Schizophragma hydrangeoides*, Sieb. et Zucc. (t. 8520) and *Streptocarpus cyaneus*, S. Moore (t. 8521).

The *Stanhopea* was originally described as long ago as 1805 by Humboldt and Bonpland, under the generic name of *Epidendrum*, from specimens collected near Cuenca, Ecuador. Some confusion has arisen owing to a variety of *S. eburnea* having been named *S. grandiflora* by Lindley. Further material of the true *S. grandiflora* was collected at Cuenca and a coloured sketch was made by Mr. Consul Lehmann, whose collections are now at Kew. The figure was prepared from a plant which flowered in 1912 in Sir Frank Crisp's collection at Friar Park, Henley.

Rhododendron haematocheilum is one of the Chinese species raised by Messrs. J. Veitch & Sons from seed collected by Mr. E. H. Wilson. The plant resembles *R. Davidii* but is easily distinguished by its much less elongated inflorescence and by the glabrous, smooth ovary and style. *R. Fargesii*, Franch. and *R. Sheltonae*, Hems. and E. H. Wils. are probably its nearest allies. The corolla is at first blood-red in colour and fades to a rich carmine.

The Gesneraceous plant which forms the subject of the next illustration belongs to a very natural group of species formerly referred in part to *Episcia* and in part to *Alloplectus* and now brought together under the old name *Nautilocalyx*. *N. pallidus* is a native of Peru where it was collected by Mr. Forget for Messrs. F. Sander & Sons, St. Albans, to whom we are indebted for the plant from which the figure was made. Two other species of this genus *N. Lynchii* and *N. bullatus* are also in cultivation.

The name *Schizophragma hydrangeoides* has been erroneously applied for a couple of generations to *Hydrangea petiolaris*, Sieb. and Zucc., an allied Japanese shrub which is easily distinguished by its sterile flowers with four segments, whilst in *Schizophragma* the sterile flowers have but a single bract. The true *S. hydrangeoides*, however, is a comparatively recent introduction to British gardens and the first recorded blossoming appears to have been in 1905 in the garden of the late Mr. B. E. Chambers of Grayswood, Haslemere. The spray figured was sent to Kew by Miss Willmott, Warley Place.

The *Streptocarpus* is closely allied to the well-known *S. Rexii*, Lindl., but differs in the shorter and relatively more dilated corolla tube. Mr. E. E. Galpin found *S. cyaneus* in wooded kloofs near Barberton in 1891, but the description of the species was based on specimens collected by Mr. J. Burtt Davy at Forbes Reef Bush, Swaziland, in 1905. The specimen figured was raised from seed collected by Mr. Thorncroft near Barberton and presented to Kew by Mr. W. E. Ledger, of Wimbledon. The flowers are very pleasing and vary in colour from pale lavender or blue to rosy mauve, with a few streaks of red on the three lower lobes and a blotch of yellow in the corolla tube.

Mr. Allard's Arboretum at Angers.—At La Maulévrie, in the suburbs of Angers, is situated one of the finest collections of hardy trees and shrubs in France. It belongs to Mr. G. Allard and has been formed entirely by him. The inauguration of the Arboretum dates back as far as 1858, when the site was drained and the soil treated; the first plantings, however, were not made until 1863, after which, for over thirty years, Mr. Allard was occupied in forming the main collections. Their augmentation has been assiduously carried on up to the present. The area occupied is about 17½ acres, and the number of species and varieties represented there is over two thousand. The collection is particularly noteworthy for the splendid series of conifers and oaks: of the former there are about 260 species and varieties, and of the oaks there are about half as many. The Arboretum, moreover, is not more remarkable for its comprehensiveness than for the size, health and arrangement of the individual specimens. At the present time it affords probably the best object-lesson available to planters in the west of France for the adornment of their gardens and parks. It is a remarkable example, too, of what may be accomplished in the lifetime of one man, with the enthusiasm and ability such as Mr. Allard possesses.

In the course of an official visit in company with Sir F. W. Moore of Glasnevin, I spent June 11 and 12 last inspecting the Arboretum. Two days were far from exhausting its interest. Many conifers and hardwoods thrive there that are only to be found in good condition in the mildest parts of the British Isles. *Athrotaxis selaginoides*, for instance, is 15 ft. high, and *A. cupressoides* 7 ft.; the rare *Libocedrus tetragona* is 9 ft. high. The tender cypresses such as *Cupressus cashmeriana*, *C. torulosa*, *C. funebris*, etc., are all very healthy, and, owing no doubt to the sunny climate, bear cones in remarkable freedom. Angers is on an angle of land formed by the confluence of the rivers Loire and Maine which are considered to have an alleviating influence on the climate. *Styrax officinalis*, 15 ft. high and in flower; *Diospyros Kaki*, 35 ft. high, with a trunk 10 ins. in diameter; *Leptospermum scoparium*, 9 ft. high, blossoming freely; *Fabiana imbricata*, 12 ft. high; and *Illicium religiosum*, 10 ft. high, all bear testimony in its favour.

A tree of peculiar interest is *Populus euphratica*, 18 ft. high, its trunk 5 ins. thick, its foliage very glaucous and Eucalyptus-like. This is the real weeping "willow" that grew by the waters of Babylon, of which the Psalmist wrote. Mr. Allard has what is probably the most remarkable example of the weeping variety of *Sequoia gigantea* in existence. This extraordinary tree is a slender spire 65 ft. high; to its trunk, which is 15 ins. in diameter, the almost vertically hanging branches are so closely pressed that the whole tree is only some 6 ft. in spread at the base. Of similar outline is *Abies Pinsapo pendula*, 24 ft. high and 4 ft. wide at the base.

It was a pleasure to see a healthy specimen of the rare *Pinus Torreyana*, 30 ft. high; this pine, one of the 5-leaved species, too tender for most parts of Britain, is confined in a wild state to two small areas in California. *Ilex cornuta*, of which the Arboretum has many examples, is as ornamental in fruit as the common holly with us, and birds do not eat the fruit. The new *Actinidia chinensis* was flowering freely on a wall. Of the true pitch pine of the S.E.

United States (*P. palustris*), the only specimen of which at Kew was broken by the storm of March 22 last, Mr. Allard has one 10 ft. high, much more branched than was the Kew tree. *Torreya nucifera*, bearing fruit freely, is a clean-grown small tree with a trunk 8 ins. thick.

If the opportunity should occur, the city of Angers would do well to seize the chance of acquiring one of the finest collections of woody plants in existence. As far as municipal arboretums are concerned, it would possess one second to none, unless it were that maintained with such liberality by the City of Rochester in New York State.

W. J. B.

Nomenclature of Visenia.—An enquiry has recently been made at Kew respecting the authorship of the names *Visenia indica* and *Melochia indica*, the former of which is usually attributed to Houttyn and the latter to Asa Gray.

It appears that no such name as *Visenia indica* was ever published by Houttyn. He established the genus in "Handleiding," vol. viii. (1777), p. 309, the only species given there being *V. umbellata*. This "Handleiding" is "Deel 11, Planten" (14 vol. 1774–1783) of Houttyn's "Natuurlyke Historie . . . volgens het Samenstel van den Heer Linnaeus" and was also issued separately as "Handleiding tot de Plant-en Kruitkundl etc."

J. F. Gmelin in his edition of Linnaeus' "Syst. Nat." vol. ii. (1791), p. 515, has under *Wisenia* "indica. l. Wisenia. Houttugm. Linn. Pflanzensyst. 6. p. 287, t. 46. f. 3."

The publication Gmelin refers to is Christmann and Panzer's German edition of Houttyn's work vol. vi. of which is dated 1780. There the name is spelt *Visenia* and the only species given under *Visenia* is *V. umbellata*. It is perfectly clear that J. F. Gmelin is responsible for the name '*indica*' and the spelling *Wisenia*, and there is little doubt that he meant by *Wisenia indica* the plant which Houttyn called *Visenia umbellata*, but he never gave a description of it. Hasskarl in Tijdschr. Natuurl. Geschied. vol xii. (1845), p. 122, seems to have been the first to attribute the combination *Visenia indica* to "Houtt." quoting "*V. umbellata*, Bl. Bijdr. 88" as a synonym of it. He repeated it in "Plantae Javanicae" whence it passed into Miquel, "Fl. Ind. Bat." vol. 1. ii. p. 189, and other works.

As to '*Melochia indica*,' A. Gray, the first reference to it is by K. Schumann in Engl. Bot. Jahrb. xi (1888), p. 209. However A. Gray did not make that combination although he pointed out that "*Visenia* cannot be generically distinguished from *Melochia*" (Wilk. Exped. Bot. i. (1854), 193). K. Schumann's reference to Miquel on one side and to A. Gray on the other makes it perfectly clear that he considered A. Gray as responsible for all the new combinations arising out of the reduction of *Visenia* to *Melochia*, hence *Visenia indica*, Houtt. (ex Miquel): *Melochia indica* (Houtt.) A. Gray. The earliest specific name for the plant in question is "*umbellata*" and the correct combination under *Melochia* should therefore be *M. umbellata*.

O. S.

Trees and Shrubs, Vol. ii., part iv.—We have received the fourth, and concluding, part of the second volume of Professor Sargent's publication. It contains twenty-five plates by Mr. C. E. Faxon and accompanying letterpress by the editor and Mr. Alfred Rehder. Mr. Faxon's drawings show, as usual, his admirable faculty of bringing out the salient characters of his subject with greatest economy of line; and the descriptions and notes reveal all the care and thoroughness that characterise their respective authors. The printing and paper are of the highest quality and the part as a whole maintains the high standard we have learned to expect in works emanating from the Arnold Arboretum. This publication, the only periodical in English devoted exclusively to the botanical consideration of ligneous plants, has now issued 200 plates. It is valuable not only for its illustrations and the text specially pertaining to them, but also for the frequent reviews and analytical keys of genera and geographical groups of trees and shrubs. In previous issues the Asiatic maples and Viburnums, the Phellodendrons, and the *Parthenocissus* group of *Vitis* have been exhaustively dealt with. In the present part Prof. Sargent gives five plates of American species of *Æsculus* with descriptions of three new species and a critical review of the whole group of American Pavias.

To those who have had to do with the hickories it has long been evident that there are, wild in the United States, numerous forms which could not reasonably be assigned to any of the described species. Prof. Sargent now descibes three new species and several new varieties and hybrids. It is interesting to see that after adopting *Hicoria* in place of the more general *Carya* as the generic term for the hickories in the *Silva of North America* and in the *Manual of the Trees of North America*, Prof. Sargent has now reverted to the older and commoner usage. The reason for the change does not appear to be given, but one welcomes it.

Thrinax Wendlandiana, a new palm inhabiting marshy lands in Florida and Cuba, originally described by Beccari in *Webbia*, ii., p. 265, is figured. Twenty-seven new species of *Crataegus* are described, two of them illustrated by plates.

A review of the interesting group of crabs belonging to the *Coronariae* section of *Malus* is published, and two new species are described by Mr. Rehder. It now appears that the *Pyrus angustifolia* of Aiton is identical with the tree previously named *P. coronaria* by Linnaeus, thus leaving the tree so long grown in gardens under the latter name without one. Mr. Rehder has named it *Malus fragrans*. The narrow-leaved glabrous tree we have so long known as *P. angustifolia* becomes *Malus* (or *Pyrus*) *coronaria*. This species, however, being rather tender is not frequent in English gardens, but it has lately been added to the Kew collection. The name of a third species, *ioensis*, which has become popular in its double-flowered forms in recent years, stands. The typical form has recently been figured in the Botanical Magazine t. 8488.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 9.] **[1913.**

LII.—MINOR AGRICULTURAL INDUSTRIES.

III. FLAX (FIBRE AND SEED).

W. DALLIMORE.

For several centuries the flax plant, *Linum usitatissimum*, L., has been looked upon as one of the regular minor agricultural crops of certain parts of Great Britain, and, more particularly, of Ireland, where climatic conditions and marketing facilities are alike favourable. But the importance of the crop, more especially since the advent of machine-made cotton fabrics, and the introduction of cheap and rapid transport arrangements with other flax-producing countries, has been subject to considerable fluctuations; periods of activity and good prices being succeeded by years of unsatisfactory monetary returns, resulting in a diminished acreage; followed again by a cycle of years of increased prosperity and extended cultivation.

The area under cultivation in Ireland has varied considerably during the last 15 years, but has usually been between 34,000 and 50,000 acres. The United Kingdom on the other hand has shown a steady decline, and it is doubtful whether as many as 100 acres have been placed under flax during the last three years.

There are, however, signs that interest is reasserting itself in the subject. Prices of imported fibre have advanced considerably during late years; some of the foreign flax-producing countries are manufacturing more of their own fibre than hitherto; agricultural matters are engaging the critical attention of Parliament; the Development Commissioners have decided that the flax industry is worthy of encouragement in Great Britain, and assistance has been authorised to help forward certain experimental work, whilst the Department of Agriculture for Ireland are encouraging the cultivation of flax by experimental work, instruction, and a system of prizes for good cultivation and fibre preparation.

It is not, however, as a fibre plant alone that the flax is of value for almost as much importance attaches to its seed. The seed (linseed of commerce) is rich in oil, which is largely used in the preparation of paints, &c., whilst the residue is a valuable cattle food when prepared in the form of cake. Some countries grow flax almost entirely for the seed, others for both seed and fibre. Russia is the principal fibre-producing country, and her exports for 1912 were 311,806 tons of fibre, valued at £11,384,550. She also exported 36,403 tons of tow or inferior fibre, worth £901,481, and 164,419 tons of linseed, valued at £2,152,910.

(32221—6a.) Wt. 212—780, 1125. 12/13. D & S.

Before proceeding to consider the industry in the British Isles, it may be advisable to indicate, approximately, the extent of the world's production of flax, for fibre and seed, and the countries in which the crop is principally grown. Indications of these items are given in the "United States Year Book." The volume for 1911 has been used, and the year 1909 selected for special notice. In 1909 the amount of fibre was returned at about 618,140 tons from the principal fibre-producing countries, and the linseed crops for the same year at 100,943,000 bushels. The combined crops accounted for the cultivation of about 13,000,000 acres of land. These figures apply only to those countries which make regular returns.

The following extracts dealing with acreage, fibre, and linseed crops are taken from the above-named work. It must, however, be clearly understood that the acreage under cultivation cannot be accepted as a definite indication of the prospective crops of either fibre or seed, the yield being largely determined by climatic and cultural conditions.

Acreage under Flax (*Fibre and Seed*) 1908–1910.

—	1908.	1909.	1910.
North America—	Acres.	Acres.	Acres.
United States	2,679,000	2,083,100	2,467,000
Manitoba	23,400	22,400	24,600
Saskatchewan	110,000	110,300	438,000
Alberta	5,900	5,800	14,300
Total for N. America ...	2,818,300	2,221,600	2,943,900
South America—			
Argentina...	3,438,300	3,791,300	3,596,800
Uruguay	63,500	45,300	—
Total for S. America ...	3,501,800	3,836,600	—
Europe—			
Austria	123,700	111,100	95,900
Hungary proper	27,100	23,400	21,100
Croatia-Slavonia	17,500	—	—
Belgium	51,200	39,300	—
Bulgaria	300	400	900
France	70,600	50,500	53,600
Italy	—	—	4,400
Netherlands	35,600	24,800	29,000
Roumania...	44,900	30,100	33,100
Russia proper	3,250,900	3,120,200	—
Poland	87,500	90,600	—
Northern Caucasia	63,500	63,300	—
Sweden	4,500	4,200	—
United Kingdom (Ireland) ...	46,900	38,100	46,000
Total for Europe ...	3,824,200	3,596,000	—
Carried forward			

Acreage under Flax, 1908-1910—cont.

—	1908.	1909.	1910.
Brought forward ...			
Asia—	Acres.	Acres.	Acres.
British India including such native States as report.	2,099,400	2,997,000	3,194,600
Central Asia (four provinces only)	75,300	176,600	—
Siberia	111,700	128,800	—
Transcaucasia	—	22,900	—
Total for Asia	2,286,400	3,325,300	—
Africa—			
Algeria	1,000	—	—
Grand total	12,431,700	12,979,500	—

Flax Fibre produced in Europe and Asiatic-Russia, 1908-1910.

—	1908.	1909.	1910.
Europe—	Pounds.	Pounds.	Pounds.
Austria	74,106,000	68,136,000	50,191,000
Hungary proper	19,965,000	20,000,000	18,492,000
Croatia-Slavonia	8,861,000	9,000,000	8,000,000
Bosnia-Herzegovina	1,400,000	1,400,000	1,000,000
Belgium	27,000,000	27,000,000	28,000,000
Bulgaria	168,000	200,000	709,000
France	47,886,000	30,494,000	33,106,000
Italy	7,000,000	7,242,000	6,883,000
Netherlands	19,692,000	13,438,000	14,189,000
Roumania...	2,404,000	1,628,000	4,448,000
Russia proper	1,500,000,000	1,022,484,000	—
Poland	70,000,000	42,450,000	—
Northern Caucasia	26,000,000	26,130,000	—
Servia	1,032,000	1,100,000	1,100,000
Sweden	1,547,000	1,449,000	1,400,000
United Kingdom (Ireland) ...	17,745,000	16,081,000	19,882,000
Total for Europe ...	1,824,806,000	1,288,232,000	—
Asia—			
Central Asia	27,000,000	51,864,000	—
Siberia	45,785,000	38,109,000	—
Transcaucasia	10,000,000	6,429,000	—
Total for Asiatic Russia...	82,785,000	96,402,000	—
Grand total	1,907,591,000	1,384,634,000	—

Flax Seed (*Linseed Crops*) 1908–1910.

—	1908.	1909.	1910.
North America—	Bushels.	Bushels.	Bushels.
United States	25,805,000	19,513,000	12,718,000
Manitoba	281,000	317,000	290,000
Saskatchewan	1,144,000	1,787,000	3,448,000
Alberta	74,000	109,000	64,000
Mexico	150,000	150,000	150,000
Total for N. America and Mexico.	27,454,000	21,876,000	16,670,000
South America—			
Argentina...	43,333,000	41,291,000	28,212,000
Uruguay	723,000	522,000	600,000
Total for S. America ...	44,056,000	41,813,000	28,612,000
Europe—			
Austria	932,000	852,000	663,000
Hungary proper	190,000	200,000	164,000
Croatia-Slavonia	30,000	30,000	30,000
Bosnia Herzegovina	4,000	4,000	4,000
Belgium	300,000	300,000	300,000
Bulgaria	2,000	2,000	8,000
France	722,000	436,000	416,000
Italy	—	281,000	232,000
Netherlands	341,000	219,000	316,000
Roumania...	180,000	205,000	363,000
Russia proper	17,326,000	19,767,000	—
Poland	903,000	948,000	—
Northern Caucasia	410,000	583,000	—
Sweden	22,000	21,000	—
Total for Europe ...	21,362,000	23,848,000	—
Asia—			
British India including such native states as report.	6,528,000	11,552,000	17,104,000
Central Asia	495,000	966,000	—
Siberia	797,000	771,000	—
Transcaucasia	150,000	107,000	—
Total for Asia	7,970,000	13,396,000	—
Africa—			
Algeria	8,000	10,000	10,000
Grand total	100,850,000	100,943,000	—

An idea of the requirements of certain countries may be gleaned from the fact that although the United States cultivates nearly 2½ millions of acres of flax annually for fibre or seeds, she imports between 7000 and 9000 tons of fibre each year to make good the deficiency in her requirements. Germany is credited with the

importation of two-thirds of her flax fibre, and Great Britain and Ireland require between 60,000 and 80,000 tons of fibre each year to keep their mills at work. In other words Great Britain is entirely dependent for her fibre on outside sources, whilst Ireland is only growing about one-fifth of the amount she uses. At the same time the fact has been amply proved in the past that both countries can produce fibre equal in quality to that produced by any other country. In addition to her imports of fibre, the United Kingdom is a customer to other countries for an amount of linseed which approaches annually the value of £4,500,000.

The following tables show the quantity and value of flax fibre and seed imported by the United Kingdom during the years 1909–1912, and 1908–1912 respectively. The imports of fibre and tow for the years 1909–11 are taken from the "Supplements to the Annual Statement of the Trade of the United Kingdom with Foreign Countries and British Possessions" for the years 1910–11, and the imports of fibre and tow for 1912, and linseed for the years 1908–12, from vol. i, of the same publication, for the year 1912 :—

Imports of Flax (dressed and undressed) for the years 1909–1912.

——	1909.	1910.	1911.	1912.	1909.	1910.	1911.	1912.
	Tons.	Tons.	Tons.	Tons.	£	£	£	£
Russia ...	49,651	50,931	46,942	68,453	1,618,429	1,883,228	2,052,191	2,777,911
Germany ...	622	374	834	226	25,034	18,341	33,282	15,259
Netherlands	2,732	2,270	1,894	1,927	155,660	135,093	124,248	120,973
Belgium ...	19,070	15,453	12,137	16,205	1,303,408	1,133,906	1,054,288	1,421,529
France ...	298	165	296	252	15,713	8,039	13,025	12,587
Other Foreign Countries.	51	61	122	12	1,775	1,698	4,379	221
Total from Foreign Countries.	72,424	69,254	62,225	87,075	3,120,019	3,180,305	3,281,413	4,348,480

Imports of Tow or Codilla for the years 1909–1912.

——	1909.	1910.	1911.	1912.	1909.	1910.	1911.	1912.
	Tons.	Tons.	Tons.	Tons.	£	£	£	£
Russia ...	12,360	11,140	11,450	12,366	333,287	328,189	382,648	415,990
Germany ...	229	523	713	384	5,920	15,848	22,186	16,533
Netherlands	219	366	175	95	5,514	9,737	4,920	2,631
Belgium ...	4,056	5,678	4,768	5,465	61,929	100,868	92,503	102,150
France ...	394	646	309	111	3,508	6,603	3,391	1,031
Other Foreign Countries.	90	77	215	273	1,977	2,516	3,528	3,572
Total from Foreign Countries.	17,348	18,430	17,648	18,694	412,135	463,761	509,176	541,907

Imports of Linseed for years 1908–1912.

—	1908.	1909.	1910.	1911.	1912.	1908.	1909.	1910.	1911.	1912.
	Qrs.	Qrs.	Qrs.	Qrs.	Qrs.	£	£	£	£	£
Russia ...	269,068	179,377	229,504	183,199	260,039	557,306	425,138	713,246	608,361	791,145
Germany ...	4,656	3,028	7,273	3,655	1,590	9,825	6,348	23,246	12,638	4,785
Netherlands ...	10,542	10,472	11,470	15,071	16,377	30,512	29,240	38,302	52,619	54,783
Belgium ...	13,016	7,097	4,788	1,228	975	28,693	15,792	14,365	4,746	3,871
France ...	1,650	19	1,038	43	2,362	3,372	43	3,268	147	9,148
Turkey, European.	967	1,623	14,242	2,658	3,285	2,066	4,139	50,874	9,339	10,761
Turkey, Asiatic	279	468	1,277	861	2,168	625	1,165	4,941	2,920	6,708
Morocco ...	2,721	3,318	4,737	16,795	12,089	6,335	7,965	14,364	55,358	37,569
China	—	—	—	607	30,561	—	—	—	2,121	95,594
United States of America.	71,488	35,293	22,643	1,217	47,578	154,486	86,558	59,528	4,363	123,075
Uruguay ...	24,692	12,362	308	1,995	7,370	50,409	26,721	895	6,900	23,120
Argentine Republic.	1,205,147	873,617	398,062	331,464	387,853	2,443,427	1,829,989	1,139,651	1,114,917	1,162,157
Other Foreign Countries.	6,571	4,090	1,150	1,882	4,551	14,138	8,571	3,281	6,109	12,864
Total from Foreign Countries.	1,610,797	1,130,764	696,492	560,675	776,798	3,301,194	2,441,669	2,065,961	1,880,538	2,335,580
British India ..	409,010	540,161	774,665	833,107	639,239	907,712	1,250,918	2,409,281	2,847,649	2,003,824
Canada ...	47,199	25,808	7,028	—	9,723	97,668	67,764	20,214	—	24,437
Other British Possessions.	189	695	74	92	759	440	1,840	262	349	2,358
Total from British Possessions.	456,398	566,664	781,767	833,199	649,721	1,005,820	1,320,522	2,429,757	2,847,998	2,030,619
Total ...	2,067,195	1,697,428	1,478,259	1,393,874	1,426,519	4,307,014	3,762,191	4,495,718	4,728,536	4,366,199

By a comparison of these figures it will be found that the value of flax has risen from about £43 1*s.* 10*d.* a ton in 1909 to nearly £50 a ton in 1912, the price in 1911 being £52 14*s.* 8*d.* per ton. During the same time tow, or short flax, has increased in value from about £23 15*s.* in 1909 to nearly £29 in 1912. This alone should prove an inducement for farmers to recommence the culture of flax.

The introduction of steam-driven machinery for the manufacture of linen led to the centralisation of that industry, and the cultivation of flax has gradually become similarly restricted, thus whilst the early years of last century saw the crop widely distributed in England and Ireland, the closing years found it confined almost entirely to Yorkshire, Lincolnshire and north-east Ireland. The principal centres of linen manufacture are Leeds, Dundee and Belfast, and the nearer the crop is grown to those places the greater should be the profit.

United Kingdom.—The flax-growing industry in the United Kingdom appears to have been in its most prosperous condition from the year 1863 to 1870. In the latter year the record crop of 23,957 acres was produced in Great Britain ; Ireland having reached her record of 301,693 acres in 1864. From 1870, however, the area under flax has steadily decreased, with now and then an improved year, until the present time. By 1879 Great Britain's crop was down to 7055 acres ; in 1880 it rose by about 1900 acres but two years later it dropped to 5220 acres. In 1895 the area

under flax was returned at 2000 acres; by 1902 the acreage was reduced to 824; in 1905, 437 acres were sown and a year later the crop was returned at only 263 acres.

Ireland has always grown more flax than Great Britain but her acreage indicates a similar shrinkage. In 1870 flax occupied 194,910 acres. By 1879 it was only grown upon 128,004 acres; 1880 witnessed an increase to 157,534 acres; by 1882 the acreage was down to 113,502. In 1895, 95,000 acres were sown; by 1898 the area under flax is said to have shrunk to 34,469 acres; by 1902 the acreage had risen to 49,742 and a somewhat similar acreage was recorded in 1910, but in 1909 the return showed only 38,116 acres under flax cultivation.

The area under cultivation cannot, however, be accepted as an accurate guide to the quantity of fibre produced as that is apt to vary considerably from year to year. Thus, in 1854, when Ireland grew 151,403 acres of flax she produced 35,606 tons of fibre, but in 1867 when 253,257 acres were placed under the crop, the yield of of fibre only amounted to 35,397 tons. Again in Ireland's record year of 1864 when the crop covered 301,693 acres, the yield of fibre was 64,506 tons, but the following year when the area under flax was reduced by about 50,000 acres, the yield was down to 39,561 tons. The greatest difference, however, is noticeable between the acreage and yield of the years 1855 and 1868. In the former year flax covered 97,075 acres and yielded 23,428 tons of fibre, whereas in the latter year 206,483 acres only yielded 24,987 tons of fibre. The yield of fibre from the best seed is said to vary on well cultivated land from 5 cwt. to 10 cwt. an acre, but the latter quantity is rarely reached.

Although the production of fibre has diminished in Ireland to such a serious extent during the last 40 years, the linen industry has increased enormously during the same period. According to an article which appeared in the "Journal of the Society of Arts," March 4th, 1910, p. 424, there were 650,774 spinning spindles in Ireland in 1864, but in 1908 the number was 913,423 and of doubling spindles, 18,254. Power looms are said to have been introduced in 1850. In 1864 there were 8187 in Ireland, whilst in 1908 the number had risen to 35,386.

The weak condition of the flax industry in the United Kingdom has occupied the attention of Parliament and leading agriculturists during late years. In December, 1909, a Departmental Committee was appointed to enquire into the present state of the flax-growing industry in Ireland and the causes contributing to its decline, and to submit recommendations. The result was published in a Parliamentary Paper [Cd. 5502]. Amongst other results a scheme of apprenticeships in the cultivation and handling of flax was instituted by the Department of Agriculture and Technical Instruction for Ireland in 1911. This is described as follows in the Department's Journal for 1911–12, vol. xii., p. 156.

"The Department have made arrangements for the training, as apprentices to the flax-growing industry, of a limited number of young men who desire to become qualified for the position of Flax Instructor. Apprenticeship will extend over a period of about twelve months.

"The apprentices will receive instruction and must take part in all operations connected with the cultivation, retting, and scutching of flax, and with the marketing of the fibre. They will be required to devote their whole time to such work.

"Applicants for apprenticeships must be at least 21 years of age, in good health, and of strong constitution.

"The apprenticeships will be awarded on the result of an examination, which will include written tests in English and arithmetic. Each candidate will also be examined orally as to his knowledge of flax-growing, and his general suitability for an apprenticeship. Preference will be given to those who have attended Winter Agricultural Classes. No expenses will be allowed to candidates in connection with their attendance at this examination.

"Successful candidates will be called up for taining about the beginning of October. They will receive wages at the rate of fifteen shillings per week from the date of their commencing work, and will be required to find their own board and lodging. The apprenticeship may be determined at any time by one week's notice in writing on either side.

"While it is probable that apprentices who complete their training satisfactorily will be offered appoinments as instructors, at a salary of about two pounds per week, the Department do not undertake to procure employment for any apprentice on the conclusion of his training."

In the same volume, pp. 397–399, a scheme of prizes for the guidance of county committees is outlined for the encouragement of the culture of flax and the preparation of its fibre. The scheme is divided into two sections. Section A refers to exhibitions of flax; prizes being offered for growers, scutchers, other employees and mill-owners. Section B is subdivided as follows:—

(*a.*) For growers, the valuation of whose holding does not exceed £10, and who grow at least half a statute acre of flax, or sow at least ¼ bag of seed.

(*b.*) For growers, the valuation of whose holding exceeds £10 but does not exceed £25, and who grow at least one statute acre of flax or sow at least 1 bag of seed.

(*d.*) For growers, the valuation of whose holding exceeds £50, and who grow at least three statute acres of flax, or sow at least 1½ bags of seed.

It is stipulated that judges shall take into consideration freedom of crop from weeds; uniformity of crop; length and quality of crop.

Since 1901, the Department have been conducting experiments in manuring, the use of various types of seed, and several other important questions. The results of these experiments have been published from time to time in the Department's Journal, notably in vols. ii, pp. 636–653; iii, pp. 663–681; iv, pp. 616–635; v, pp. 449–464; vii, pp. 250–268; viii, pp. 423–440; ix, pp. 270–284; x, pp. 279–293; xi, pp. 327–341; xii, pp. 502–517.

From manurial experiments conducted during the years 1905–08, the following conclusions were arrived at (vol. xii, p. 502):—

"(1.) Of the potash manures in general use Kainit and Muriate of Potash are the most suitable for flax, either of these manures

being preferable to Sulphate of Potash, and that corresponding dressings of Kainit and Muriate of Potash give much the same increase in yield.

"(2.) Kainit or Muriate of Potash may be applied either in autumn or at sowing time with equally good results.

"(3.) The results from a combination of Kainit and a slow-acting nitrogenous manure, such as rape meal, although in some seasons satisfactory, were too irregular to warrant the general adoption of this mixture as a manure for flax in preference to dressings of Kainit or Muriate of Potash now so generally applied."

From the 1910 experiments it was found that a dressing of Muriate of Potash at the rate of 1 cwt. to the statute acre resulted in an estimated profit of £2 0*s.* 10*d.* per acre over unmanured ground. When 1 cwt. of Muriate of Potash and ¼ cwt. of Sulphate of Ammonia was used, the profit was estimated at £2 16*s.* 9*d.* a statute acre, and £2 17*s.* 8*d.* a statute acre when 1 cwt. of Muriate of Potash and ½ cwt. of Sulphate of Ammonia was applied. When, however, 1 cwt. of Muriate of Potash, ¼ cwt. of Sulphate of Ammonia, and 2 cwt. of Steamed Bone Flour was used there was an estimated *loss* per statute acre over unmanured land of £1 8*s.* 3*d.*

The experiments indicate that Muriate of Potash and Sulphate of Ammonia in the proportion of two parts of the former to one of the latter is a suitable manure for flax, but that phosphates, whether in the form of bone meal or other guise, are unsuitable. Their unsuitability is chiefly due to their tendency to encourage weeds. The full results of the experiments for 1910 will be found in vol. xii., pp. 502–507.

The flax seed tests tend to show that quality of seed only can be relied upon to settle the question as to whether it is better to sow Riga or Dutch seed. Some years one country produces the best seed, and other years the other country. Seed from both countries, however, is likely to produce a heavier crop of fibre than Irish seed, though trials relating to this side of the question are still in progress. Seed from selected plants is said to exert a distinct influence upon fibre yield, and also upon quality. Intending planters are advised to procure the leaflet on Flax Seed (No. 29), which is revised annually in order that it may afford a guide to the best country from which to obtain seed. Planters are also advised to test the quality of their seed before making a general sowing.

With regard to Great Britain the Development Commissioners are taking an active interest in the condition of the flax industry and on their behalf a considerable amount of first hand information has been collected in the chief flax-growing countries of Europe, *i.e.*, Russia, Holland, Belgium, France, Ireland, Austria-Hungary, and Germany. Last year experiments were conducted in Bedfordshire both in growing and retting, and this year the assistance of Leeds University has been enlisted in conjunction with a Flax Growers' Association, formed last year, in carrying out experiments in flax cultivation.

A considerable amount of information collected in the above-mentioned countries, together with notes on the history of flax in Great Britain is given in an interesting article entitled "The Projected Revival of the Flax Industry in England," by J. Vargas

Eyre, Ph.D., which appeared in "Science Progress," No. 28, April 1913, pp. 596–628. Dr. Eyre explains the fluctuations which have occurred from time to time in the acreage under flax as being due largely to the price of wheat. When wheat and flax show a small margin of difference in profit per acre, then flax is dropped in preference for wheat but when wheat is cheap and flax commands a good price greater attention is paid to flax. In discussing the crop he says: "The result of the enquiry made on behalf of the Development Commissioners leaves no room for doubt that the climate is well suited to flax. The crop makes no special demand for a particular class of soil, so long as the land is properly prepared and suitably manured. Light loam, however, may be said to be most favourable and chalk least favourable to a fibre crop. Large areas of suitable land are to be found in Yorkshire and Somersetshire, as well as in the midland and eastern counties. Flax can be grown successfully as a fibre crop in this country and at the same time the seed which it bears can be profitably saved; indeed, this is the practice which was formerly adopted. The flax crop is somewhat more troublesome than the usual farm crops but no difficulty in its cultivation need be apprehended provided practical information be placed at the disposal of farmers. This could be done easily and there is every reason to believe that good crops of flax would again be raised here if attention were given to the work." With regard to retting, the author suggests that small retting depôts should be established out of public funds each one capable of dealing with the produce of 100 acres. Such retteries would doubtless be of the greatest benefit to growers and would go far towards re-establishing the industry, for the retting process in the past has been the chief stumbling-block to many growers.

Referring to the agricultural requirements of flax the author has arrived at the conclusion that good flax can be grown on a great variety of soils, providing their texture be suitable. Very heavy clay is not recommended, neither is chalk, whilst soil rich in humus and peaty moorland are also undesirable. Any other clean land, however, which is capable of producing good grain is likely to produce good flax.

With reference to seed it is said that all countries look to Russia for the principal supply. The seed is procured from the Baltic Provinces by way of Riga. It is then grown in other countries for about three seasons, giving rise to crops bearing seed which is known respectively as "Riga-Child" and "Riga-Grandchild." Where the climate is moist and dull, original Russian seed gives the best results, especially if the soil is light. Where the prevailing atmospheric conditions are dry, or the soil is somewhat heavy, better results are obtained by using "Child" seed although the results are less uniform than those from Russian seed. "Dutch-Riga-Child" seed is said to be highly favoured for sowing in Holland, Belgium, Ireland and France. It is added that "by long experience merchants have found that seed from a region where there are certain conditions of climate, is better suited for exportation to one country than to another; for example, seed from a very wet district does better in the drier climate of Holland than in

Ireland, whilst seed from a drier region is better suited to the damp climate of the north of Ireland."

In addition to the article in question, elaborate cultural details are to be found in the "Journal of the Royal Agricultural Society," 2nd series, vol. i, (1865), pp. 181–204, in articles by the Rev. Nathaniel M. Brown, Mr. P. H. Frere and Mr. H. Wells; in "British Manufacturing Industries" (1876), pp. 52–63, and pp. 64–108, on the manufacture of linen, both articles by Mr. W. T. Charley; and in "Spon's Encyclopaedia of the Industrial Arts," pp. 964–978. From these articles the following cultural instructions are taken.

It is a well known fact that flax may only be grown successfully on a long rotation system, for although it rarely occupies the ground for more than 13 weeks, it extracts a considerable amount of food material from the soil. It is equally clear that the best results can only be procured when the seed is sown on land free from coarse weed seeds. Therefore, the same plot of land is only cropped with flax at intervals of from 7 to 10 years and crops immediately preceding flax are selected to a certain extent by reason of their ground-cleaning qualities. Wheat or oats, preferably the latter, are often chosen. Deep autumn ploughing is usually recommended both on heavy and light land, to be followed in the former case by a second ploughing in spring. When light land is ploughed a second time, it is stated that it should not be turned up more than 4 inches in depth in order that the bottom may remain firm. The land must subsequently be well harrowed in order to provide a fine and even surface and is then sometimes lightly rolled. Farmyard manure is not given immediately before a flax crop on account of its liability to lie in patches and thereby encourage unequal growth, but chemical manures may be applied either with the autumn ploughing or with the spring working of the ground.

Seed sowing usually takes place between the beginning of April and the end of the first week in May according to weather conditions, and immediately follows the harrowing and rolling of the ground. Even sowing is essential to success, for if the crop is patchy, the fibre varies considerably in quality. When grown strictly for fibre close sowing is necessary, for the most suitable plants are those with single stems, but when a seed crop is desired, the seed is sown thinly to allow the plants to branch. The amount of seed used per statute acre for fibre production depends entirely upon its vegetative qualities, but usually from 2 to $2\frac{1}{2}$ bushels. On heavy land rolling is often dispensed with before sowing the seed. After sowing, the ground is lightly harrowed and sometimes rolled. When the young plants are a few inches high it is usual to go over and weed the ground. The work-people require to exercise great care in order to cause as little injury as possible to the flax, and for this reason, they work against the wind in order that the wind may assist the bent over plants to resume their erect habit.

When the crop is grown solely for fibre, harvesting is commenced as soon as the lower parts of the stems assume a yellowish hue but if seed is required, harvesting is not commenced until the seed is mature. In the former case the fibre is of superior quality. Harvesting is carried on by pulling the plants up, instead of mowing

them down, as is done with a corn crop, for the reason that however carefully the crop may be cut a certain amount of fibre will be lost. By pulling, it is also possible to keep the flax free from weeds and to keep the plants straight. When the whole crop is of a similar length harvesting is easier than when it varies, for in the latter case it is necessary to keep the various lengths together as much as possible. As the plants are pulled, the soil is knocked from the roots and they are laid in small heaps to be afterwards tied in bundles, care being taken to keep the stems whole and the fibre unblemished.

In some cases the straw is retted almost at once but in other cases it is stacked after drying and kept for some considerable time before being placed in the retting pools. In either case the seed pods are removed first either by rippling or by threshing. The first method is said to cause the least harm to the straw. It consists of drawing the upper part of the straw through an iron comb placed horizontally over a large sheet or tarpaulin when the work is carried on in the field, or over a clean barn floor when conducted indoors. Threshing is carried out by spreading the flax on hard floors and beating the heads with mallets. The former method is, however, considered the better as the flax can be kept straighter and cleaned of impurities during the process.

The first operation in the separation of the fibre from the straw is known as retting. This is sometimes accomplished by spreading the straw thinly, in straight lines, over grass fields and leaving it to the action of the weather until the fibre can be easily detached from the waste material. Even when the greatest care is exercised, however, it is a somewhat unsatisfactory method, and preference is usually given to water-retting. This may be accomplished in several ways. A system of pools or tanks, in which the depth is sufficient to allow of the plants being covered with water when almost upright, may be arranged within easy access of a river; crates sunk in a river may be used; a backwater of a river or a deep ditch may be requisitioned; or the retting may take place in heated tanks. The flax is placed loosely in tank or crate in regular rows with the roots sloping slightly downwards. When filled, a layer of rushes or straw is placed over the flax and on this, tough turves and stones are placed to weight down the flax. Fermentation is set up, which is allowed to continue until the fibre separates readily from the wood. The flax is then lifted out of the water and is spread over grass or stubble fields to dry. If the water be drawn off before the flax is removed from the tanks a certain amount of sediment is said to settle on the fibre and cause injury. The time required for retting depends on the weather, a shorter period being necessary in warm than in cold weather. From 7 to 14 days is about the normal time required. Warm water retting is conducted in specially constructed tanks, and the work is accomplished in about 3 days.

Further particulars regarding rippling and the subsequent processes of grassing, lifting, scutching, &c., may be obtained in the articles already referred to, but it is unlikely that the average agriculturist will be prepared to undertake such duties which could be carried on more economically at recognised centres, under the inspection of fibre experts.

Regarding the cost of production, Dr. Eyre remarks that it is now so long since flax was grown as a field crop in this country, that little importance can be attached to the recorded cost of production. Fifteen years ago the estimated cost of this crop in Cambridgeshire, Lincolnshire and Suffolk was said to be about £5 per acre; in Yorkshire a trifle less, and in the south of England more. It is probable, however, that these figures would now be exceeded. It would appear that only by a series of extensive trials can it be ascertained whether the crop is likely to prove remunerative in Great Britain.

With respect to flax-growing in other countries, Dr. Eyre deals exhaustively with Europe, and a very good article entitled "Cultivation, Preparation and Production of Flax and Linseed," appeared in the "Bulletin of the Imperial Institute," vol. ix, 1911, pp. 355–380. Use has been made of this article in some of the succeeding notes.

United States of America.—The position of the flax crop both as regards fibre and seed production is dealt with by Mr. L. H. Bailey, in the "Cyclopedia of American Agriculture," vol. ii, pp. 293–302, and by Mr. C. R. Dodge in the following Reports issued by the U. S. Department of Agriculture. "A Report on Flax Culture for Seed and Fibre in Europe and America," pp. 1–80; "A Report on Flax Culture for Fibre in the United States," pp. 1–87; "A Report on Flax, Hemp, Ramie and Jute," pp. 43–63; "Useful Fibre Plants of the World," Report No. 9, pp. 219–228. The centre of the industry in the United States is found in Minnesota and the two Dakotas, about 90 per cent. of the whole production being in these States. In 1905, North Dakota grew 1,357,171 acres of flax and produced 15,743,184 bushels of seed, and in the same year Minnesota produced 449,008 acres of flax and 5,073,790 bushels of seed. Fibre production was neglected to a considerable extent during the latter half of last century, but a considerable amount of attention has been paid to this branch of the crop during the last 15 or 20 years, and a great deal of experimental work has been carried out in Minnesota with a view to producing high yielding strains of seed and of discovering the most economical methods of culture.

Cultural operations are conducted on somewhat similar lines to those in force in Europe, but the crop is usually cut instead of being pulled. Good crops are said to be produced on virgin land containing lime, and when grown as one in a sequence of crops, the rotation is somewhat as follows:—Clover, flax, corn, oats, clover, wheat, corn, oats, clover, flax. In many parts a combination of seed and fibre crop is recommended on account of the high price of labour.

Canada.—Flax has long been grown in certain parts of Canada as a seed crop, but of late years attention has also been directed to its fibre. In the "Journal of the Society of Arts" for June 3rd, 1910, p. 692, flax in Canada is referred to as follows:—"There is certainly a future for flax in Canada if the recent discovery of a process of treating the straw for textile purposes turns out satisfactorily. At present flax is grown in Canada for its seed, the linseed of commerce, alone, and yields from 10 to 16 bushels per acre, at a value of 5*s*. a bushel. The cost of cultivation is about 30*s*. per acre.

While this affords a fair margin of profit, the value of this industry will be greatly enhanced if the process referred to results in the manufacture of tow from the stalks, as the straw averages 1½ tons to the acre, which would yield about 25 per cent. of tow. The refuse also can be used for paper-making." Apparently, in the same year, however, the fibre was a recognised asset, for the "Bulletin of the Imperial Institute," vol. ix, 1911, p. 378, records the fact that 439 tons of fibre, valued at £17,509 were exported to the United States in 1910, and a year previously 594 tons of fibre, worth £29,120, were exported to the same country.

The position of flax in Canada is, however, clearly indicated in Bulletin 59, "The Flax Plant; its cultivation for Seed and Fibre," pp. 1–13, of the Central Experimental Farm, Ottawa. It is there definitely stated that flax has been grown for its fibre in some parts of western Ontario for many years. It is most widely grown for its seed in Manitoba, Saskatchewan, and Alberta. In 1906, Saskatchewan, with the largest acreage of 108,834 acres, produced 1,504,814 bushels of seed. The produce of the same region in 1910 was 3,044,138 bushels. Experiments are now being conducted at various Dominion Experimental Farms, with a view to securing types of plants yielding heavy crops of fibre and seed, and of discovering improved and more economic methods of handling than already exist. The conclusion appears to have been arrived at that Manitoba and Ontario seed produces a heavier crop of seed than that imported from Russia and Holland. The heaviest yielding kind, however, is one raised in Minnesota, and named Minnesota No. 25. In carefully conducted experiments this has been found to yield 32·9 bushels of seed per acre, the next highest being Manitoba seed with 30 bushels per acre.

A series of experiments were conducted in 1896 for the purpose of ascertaining the most satisfactory regions for fibre production, the result being Nappan, Ottawa, and Agassiz. The heaviest yield of pulled flax was at Ottawa, where 7,878 lbs. per acre were obtained, and where the seed had been sown at the rate of 80 lbs. per acre.

India.—An exhaustive account of the cultivation of flax in India is given by Sir G. Watt in his work on "The Commercial Products of India," pp. 719–731. The plant is grown there more for the sake of its seed than for its fibre, although interest in fibre production is apparently on the increase. In the years 1906–7 the acreage of land carrying a pure flax or linseed crop was returned at 3,028,200 acres, whilst 633,000 acres were sown with a mixed crop of linseed and other oil-producing seeds.

The chief centre of the industry, as given by Sir G. Watt, is Bengal, followed closely by the Central Provinces and Berar. Then come the United Provinces; Bombay and Sind; Panjáb; Hyderabad, Central India and Rajputana; Madras, Assam and Burma. The amount grown in some of these regions is, however, of comparatively little importance. The following details are taken from p. 726 of the above-mentioned work:—"It is thus a crop that may be spoken of as produced most abundantly within the indigo districts. At all events it is mainly grown, so far as Bengal is concerned, in Tirhut and Bihar. Mukerji (Handbook Ind. Agrc.,

pp. 272–4), says it is believed to love well-drained heavy, loamy soils, especially if rich in lime, such as those often under mustard or til crops. It requires more or less the same soil, in fact, as wheat and gram. The land should be prepared in September, and thorough and deep ploughing is desirable. Before the close of the monsoons the sowings are usually completed. The seed rate has been given as 8 to 12 lb. to the acre. If sown late, irrigation may be necessary, but when the plant is in flower rainfall is injurious. The crop is harvested by the end of February, or the beginning of March, and the seed extracted by flailing. Six to eight maunds of seed (say 500 to 700 lb.) is the average produce per acre. The straw is useless as fodder, and indeed it is even said that green plants eaten by cattle have been known to prove fatal. The seed is held to yield one-fourth of its own weight of oil."

An interesting account of the "Culture of Flax in India" is to be found in "The Fibrous Plants of India," by Dr. Forbes Royle, pp. 135–232. This was published in 1855, and gives a detailed account of the condition of the crop at that period.

Argentina and Uruguay.—The production of linseed is an important industry in these countries, and there is a considerable trade in seed with the British Isles. Until recently flax was grown entirely as a seed crop, but of late some attention has been turned to fibre. Between 30,000,000 and 40,000,000 bushels of seed is the annual output of these countries.

Australia.—Attention has been given to both linseed and fibre production in New South Wales, Victoria, Queensland, aud South Australia, but so far neither crop can be said to be of any particular importance. Articles on the position of the crops in Victoria are to be found in the Journal of the Agricultural Department, Victoria, April 1906, p. 211, and May 1906, pp. 298–308.

Other references to flax in Australia are given in the Journal of Agriculture, South Australia, January 1st 1904, p. 370, and the same journal for September 1908, p. 189.

The Bulletin of the Imperial Institute, vol. ix., 1911, p. 370, records the receipt of a sample of seed grown in Anglo-Egyptian Sudan, which was valued by experts at 47*s.* 6*d.* per quarter if marketed in limited quantities, and at about 44*s.* 0*d.* per quarter if imported in large supplies. (May 1906.)

British East Africa.—During the last few years experiments in flax culture have been conducted at several Agricultural Experimental Stations and Mission Centres in British East Africa, more for the sake of the seed than the fibre, however. In the event of flax proving a suitable crop for the country it is more than likely that the fibre will be given consideration likewise. The following extracts taken from the "Annual Report of the Department of Agriculture, British East Africa," for 1911–1912, give an idea of the position up to date. On page 77, Mr. H. Powell, General Manager of the Kabete Experimental Farm, writes:—"Four acres of linseed, Riga variety, were sown on 1st May, 1911, and harvested on 12th September. It yielded 588 lbs. per acre. This crop continues to do well here. Ten acres were sown on the 21st November and cut on the 22nd March 1912; the yield was

319 lbs. per acre. About the middle of January the crop was completely eaten off by caterpillars, but the heavy rains in February enabled the crop, which at one time was on the point of being ploughed up, to recover. The prevalent wet weather during April retarded threshing and the yield was really in excess of the figure given."

Regarding its culture at the Government Experimental Farm, Kibos, Mr. H. H. Holder, Plant Instructor, wrote on June 25th 1912 (*see* p. 100):—" Linseed.—The success which attended the trials made by the Rev. Father Witlox, of the Roman Catholic Mission at Kakamega, two years ago, and also those by certain headmen and natives there, led to a series of experiments being started at Kibos with two varieties, introduced by the Chief of the Economic Plant Division from Ceylon, and two Russian varieties from the Kabete Experimental Farm, Nairobi. The Ceylon varieties which consist of one brown and one white are lower growing in habit and produce a considerably larger sized seed than that of the Russian varieties. The trials were conducted with a view to testing their bearing qualities. Accordingly four plots were laid down on the same ground as follows :—

" Two plots, two acres each in size, were sown broadcast with the Russian varieties, and two plots, one acre each, sown in drills with the Ceylon varieties.

" All the varieties made fairly good growth at first, but the Ceylon varieties appeared to have withstood the dry spell in June much better.

" Although the climatic conditions at Kibos are not considered to be altogether ideal for linseed cultivation, it might be premature to ascribe the cause for the poor results obtained with this first trial to this alone, as planting was carried out rather late in the season. Indeed, judging by the rapid spurt of the Ceylon varieties made after every shower of rain which occurred when the plants were in the field, it appears safe to believe that, planted at the commencement of the rains in March or April on a well-drained and thoroughly prepared soil, the crop may be cultivated with equal success here as at Kakamega.

" Besides the native trials at Kakamega, a plot was planted at Sagam which did equally well under Headman Obonyo.

" Perhaps none of the other introduced crops have taken on so rapidly amongst the natives and there seems every prospect of its cultivation becoming in a short time thoroughly established throughout a large portion of the Nyanza Province."

A report on various samples of fibre received from this region is given in the Bulletin of the Imperial Institute, vol. ix, 1911, pp. 11–14. The best sample received from the Government Experimental Farm at Kabete was valued in July 1910, at £30 per ton.

From this country a sample of seed was received at the Imperial Institute in 1905, which was valued at 40*s.* 0*d.* to 42*s.* 6*d.* per quarter.

In 1908 a sample was received from Natal which was valued at £11 per ton if delivered in small lots of 50 to 100 tons, or at £10 10*s.* per ton if imported in quantities of 500 to 1000 tons.

An abstract of a paper on "The Growing of Linseed as a Farm Crop," which was read before the Agricultural Section at the recent meeting of the British Association, by Mr. Duncan Davidson, appeared in the "Journal of the Royal Society of Arts," Sept. 26 1913, pp. 984–985. The object of the paper was the encouragement of linseed culture by farmers as a food substance for cattle. The author urged the special value of linseed as a cream substitute for calves, its superiority as a fattening and finishing food for older cattle, its ability to secure good condition in horses, its unrivalled effect as a tonic for ailing stock, not to mention its excellence for sheep as reasons for its culture. He discussed the increasing demand for linseed oil and the advanced price of linseed and cake which almost prohibit their use as stock foods. He further claimed that experiments go far to prove that 10 to 15 cwt. of linseed can be grown at a cost of about £6 per acre on medium land whilst £10 is paid for half a ton of linseed meal containing up to 10 per cent. of cheaper meal. He gave the cost of production on a well-managed farm of medium land at from £6 to £7 per acre and said that a yield of 20 to 30 bushels of grain and 25 to 35 cwt. of straw might be expected if a suitable kind of seed were sown. Full details of cultivation were given. For seed growing the author recommended sowing from 1½ to 2 bushels of seed per acre (the seed weighing about 56 lbs to the bushel) more seed being necessary for a fibre crop alone.

Diseases of Flax.—A few diseases are rather troublesome at times. The worst is possibly that known by the name of "Flax wilt." It is prevalent in France, Holland, Belgium, Ireland, the United States, &c., but according to Massee, "Diseases of Cultivated Plants and Trees," p. 495, it is uncommon in Russia. It is due to the presence of a fungus (*Fusarium lini*, Boll.), and affected plants may be detected by the manner in which they suddenly wilt or fall over and die. The only possible remedy appears to be continual change of ground for the crop and this is probably one reason why flax is only successfully grown in many countries by a long rotation system. Flax rust (*Melampsora lini*, DC.), is another fungus disease which sometimes causes trouble. Its presence may be noted by orange-coloured spots on the leaves, &c. Mr. Massee refers to it on p. 326 of the previously-mentioned work. Wireworms sometimes cause trouble, more especially when a flax crop is grown upon newly broken up grass land. There are also certain caterpillars which may cause injury.

In conclusion it would appear that the present position of the flax industry is such as to warrant an extended series of trials of the cultivation of flax both for fibre and seed with the object of ascertaining the suitability of flax as a regular farm crop, in places where it is not already grown. The farmer has little to lose through such trials and much to gain. In places where the summer is not sufficiently long, or warm enough, to mature a corn crop it seems quite likely that flax would succeed, since the harvesting of the crop is not so dependent upon weather conditions as it is for wheat or oats whilst flax occupies the ground for a much shorter time.

LIII.—ACANTHUS PUBESCENS AND A. ARBOREUS.

W. B. Turrill.

The Tropical African *Acanthaceae* were worked out by the late Mr. C. B. Clarke and published in the *Flora of Tropical Africa* in 1899–1900. On p. 106 of vol. v. of this work he describes *Acanthus arboreus*, Forskal, and reduces as synonymous with it the species *A. polystachyus*, Delile, *A. pubescens*, Engler, and *A. Gaëd*, Lindau, and the variety *pubescens*, T. Thoms., of *A. arboreus*. In naming the *Acanthaceae* of the Kässner Expedition, 1908, it was found that a revision of the synonyms given under and of the characters given for *A. arboreus*, Forsk., in the flora was necessary. The results of the investigation are recorded below.

The degree of hairiness in *A. pubescens*, Engl., and the allied species is not to be relied upon as a specific or even varietal character, but characters which are constant and in accordance with geographical distribution are to be found in the sepals. Before giving the results obtained by the use of these characters it will be well to give a brief historical resumé of the species and their synonyms under discussion. *A. arboreus* was described by Forskal from specimens collected in Arabia. The description is meagre but sufficient to show that *A. pubescens*, Engl., was not the plant meant. The name *A. arboreus* is the name generally accepted for the Abyssinian and Somaliland plant as well as for the Arabian plant. At Kew there is only one specimen (*Schweinfurth* 1112) collected in Arabia and this has only an imperfect calyx. If, however, the Arabian and Abyssinian plants prove to be different the latter must bear the name *A. polystachyus*, Delile, and the name *A. arboreus*, Forsk., must be retained for the former. Thanks to the good figure and description given by Delile (Cent. Pl. Afr. 62, t. 1, fig. 2), there can be no doubt as to the identity of his *A. polystachyus* with the common Abyssinian and Somaliland plant at present bearing the name *A. arboreus*, Forsk.

A form of *A. arboreus*, Forsk., has been described by Lindau from Somaliland as *A. Gaëd.* The type specimen, *Hildebrandt* 1399, is at Kew and appears to differ from typical *A. arboreus*, Forsk., only in having smaller flowers. *Acanthus arboreus*, Forsk., var. *pubescens* is first used (as a nomen nudum) in Speke's Nile Journey, Appendix, p. 643. It was shortly described by Oliver in Trans. Linn. Soc., vol. xxix., p. 129. The specimen on which this variety was founded, namely, *Speke and Grant* 136, must be taken as the type of *A. pubescens*, Engler, though that author included under the one name two other specimens one of which, *Steudner* 1532, is merely a pubescent form of *A. arboreus*, Forsk., while the other is not represented at Kew and has not been seen by the writer.

To *A. pubescens*, Engler, must be referred *A. ugandensis*, C. B. Clarke, published in the Journal of the Linnean Society, vol. xxxvii., p. 527, and including specimens collected by *Dawe* and *Evan James* in Uganda, and by *C. F. Elliott* in British East Africa. These specimens together with the material from Uganda and British and German East Africa placed by Clarke under *A. arboreus*, Forsk., in the Flora of Tropical Africa, and also the

additions received from these countries since the publication of that work compose the Kew material of *A. pubescens*, Engler, as defined in the description below.

Kässner 3185 from German East Africa is a form differing slightly from the typical *A. pubescens* in having shorter, somewhat broader and less acuminate bracts.

The following then is the nomenclature and classification of the specimens of these two species represented in the Kew Herbarium :—

Acanthus arboreus, *Forsk.* (syn. *A. polystachyus*, Delile, probably ; *A. Gaëd*, Lindau).

Abyssinia. *Schimper* 1534, 1535 ; *Plowden* ; *Steudner* 1532, 1533.
Upper Senaar. *Kotschy* 489.

Acanthus pubescens, *Engler* (syn. *A. arboreus*, Forsk., var. *pubescens*, T. Thoms. ; *A. ugandensis*, C. B. Clarke).

Uganda. *Mahon* ; *Dawe* 237 ; *Evan James* ; *Wilson* 94 ; *Mason*.
British East Africa. *C. F. Elliott* 244 ; *Scott Elliott* 7057.
German East Africa. *Speke and Grant* 136 ; *Kässner* 3185.

To sum up, the true *Acanthus arboreus*, Forsk., if identical with *A. polystachyus*, Delile, is a plant of Arabia, Abyssinia, and Somaliland, while *A. pubescens*, Engler, has a more southern range, being common in Uganda and having been several times collected in British and German East Africa.

There is one point which owing to the lack of material has not been completely cleared up. In Trans. Linn. Soc., vol. xxix., p. 129, there is under *Acanthus arboreus*, Forsk., var. *pubescens*, a note by Col. Grant to the effect that the seeds of this plant are "covered with a down which makes the fingers itch." Speke and Grant's specimen at Kew contains no seed. However, in a capsule mounted on the same sheet as the specimen collected by Miss Mason in Uganda is a single seed and this is completely covered with stiff brown hairs which, like the well-known hairs on the fruits of species of *Mucuna*, come off easily on to the hands when rubbed and in any quantity would no doubt cause a noticeable irritation. Hence it seems that there is here another, probably constant, character for distinguishing *A. pubescens* from *A. arboreus* for the seeds of the latter are flat, smooth, and shining.

Acanthus pubescens, *Engler*, Hochgebirgs Fl. Trop. Afr. (1892), p. 390 (Acanthaceae-Acanthoideae) ; descriptionem ampliatam confecit, *W. B. Turrill* ; *A. arboreo*, Forsk., affinis, sed bracteis minoribus, sepalis lateralibus latis saepissime obtusis marginibus molliter ciliatis praecipue differt.

Planta erecta, 1–3 m. alta, caulibus subquadrangularibus glabris vel plus minusve pubescentibus. *Folia* ambitu elliptico-lanceolata, apice acuta spinescentia, basi cordata vel rotundata, usque ad 20 cm. longa, 9 cm. lata, subcoriacea, glabra vel plus minusve pubescentia, irregulariter lobata, lobis spinescentibus, nervis secondariis utrinque usque ad 14 pagina utraque conspicuis, petiolis 1–2 cm. longis. *Spicae* multiflorae ; bracteae ovatae, apice acutae vel acuminatae usque ad 2 mm. longae, 1·5 mm. latae, pagina utraque dense puberulae, marginibus spinescentes ; bracteolae lineari-lanceolatae, apice acuminatae, 1·5 cm. longae, 2–3 mm. latae, pagina utraque puberulae,

marginibus superne spinescentibus. *Sepala* 4, obtusa, dorso plus minusve pubescentia, distincte molliter ciliata ; anticum oblongo-ovatum, apice denticulatum vel integrum, usque ad 1·5 cm. longum, 9 mm. latum ; posticum ovatum, usque ad 1·5 cm. longum, 1·1 cm. latum ; lateralia elliptico-ovata, 1 cm. longa, 7 mm. lata. *Corollae* tubus 7 mm. longus, durus, extra glaber, intus dense pubescens ; limbus 5-lobatus, pubescens, usque ad 3·5 cm. longus, 3·5 cm. latus. *Stamina* 4, filamentis inter se aequalibus 2 cm. longis glabris, antheris 5 mm. longis dense ciliatis ; pollinis granula longe ellipsoidea, 50 μ longa, 30 μ diametro. *Discus* 0·5 mm. altus. *Ovarium* 2 mm. altum, 1 mm. diametro, glabrum ; stylus 2·5 cm. longus, glaber, apice breviter et aequaliter bifidus. *Acanthus arboreus*, *Forsk.*, *var. pubescens*, *Thoms*, *in Speke's Nile Journey*, *Appendix*, *p.* 643, and *Oliv. in Trans. Linn. Soc. vol.* xxix., *p.* 129. *A. arboreus*, *C. B. Clarke in Fl. Trop. Afr. vol.*, v., *p.* 106, pro parte minore, non *Forskal.* *A. ugandensis*, *C. B. Clarke*, *in Journ. Linn. Soc.* xxxvii., *p.* 527.

Tropical Africa. Uganda : Botanic Station, Entebbe, "forms a bush 10 ft. high with handsome, pink, very showy flowers, common," *A. Mahon* ; Buddu, 1170 m. altitude, "a white flowered variety," *M. T. Dawe* 237 ; Elgon District, *Sir Evan James* ; between Entebbe and Kampala, *Miss M. Mason* ; without exact locality, "a stout shrubby plant, branched, 3–7 ft. high, flowers pink. Roadsides and grassland, Uganda, very common. I have also seen a variety with white flowers but have no specimen," *Rev. C. T. Wilson* 94 ; without exact locality, "very handsome pink Acanthacea all over Uganda and Unyoro, 12–15 ft. high," *M. S. Evans* 737 ; British East Africa : Kavirondo, Nandi Range, "a tall shrubby plant, wet ground," *Scott Elliot* 7057 ; Mutagaru, Kakameja Forest, "a very common shrub as undergrowth in forests in Nyanza Province and parts of Uganda," altitude 1350–1500 m., *J. L. Moon* 572 ; without exact locality, *C. F. Elliott* 244 ; German East Africa : Usui (Ussuwi) in Uzinza (Usindja) District, *Speke and Grant*, 136 ; Ruzizi Valley in the open plain, *Kässner* 3185.

LIV.—NEW ORCHIDS ; DECADE 41.

401. **Megaclinium ugandae**, *Rolfe* ; a *M. endotrachyde*, Kränzl., scapo breviore, sepalis lateralibus acuminatis et petalis latioribus differt.

Herba epiphytica. *Pseudobulbi* tetragoni, conico-oblongi, 5 cm. longi, 1·6 cm. lati, diphylli. *Folia* oblonga vel elliptico-oblonga, subobtusa, 7 cm. longa, 2 cm. lata, subcoriacea. *Scapus* circiter 12 cm. longus, basi vaginis tubulosis obtectus ; rachis oblonga, acutangula, 6·7 cm. longa, 8 mm. lata, nervo mediano eccentrico. *Bracteae* triangulares, acuminatae, acutae, reflexae, 3–4 mm. longae. *Pedicelli* 5–6 mm. longi. *Flores* circiter 2 cm. distantes, parvi. *Sepalum* posticum suberectum, subspathulato-oblongum, obtusum, 7 mm. longum ; sepala lateralia late triangularia, reflexa, acuminata, 6–7 mm. longa ; mentum subsaccatum, 2 mm. longum. *Petala*

recurva, oblonga, subacuta, 2 mm. longa. *Labellum* 2·5 mm. longum, carnosum, basi 2 mm. latum, subconcavum, apice recurvum, subobtusum. *Columna* lata, 2 mm. longa ; dentes breves, acuti.

Tropical Africa. Uganda.

Flowered at the Royal Botanic Garden, Glasnevin, in March, 1912, and again a year later. The plant was obtained from Mr. J. O'Brien. The rachis is heavily dotted and marbled with purple brown on a light green ground, and the sepals are of much the same colour outside but more green within. The petals are light green, the lip dull purple and the column whitish-green with numerous minute purple dots.

402. **Eulophia Watkinsonii, Rolfe**; a *E. hiante*, Spreng., colore florum et labelli lobis lateralibus non falcato-divergentibus differt.

Herba terrestris. *Folia* non vidi. *Scapi* 22–40 cm. alti, vaginis spathaceis paucis obtecti ; racemi 6–12 cm. longi, 6–12-flori. *Bracteae* oblongo-lanceolatae vel ovato-oblongae, acutae, 1–1·3 cm. longae. *Pedicelli* 1·5–2 cm. longi. *Sepala* patentia, oblongo-lanceolata, acuta, 1·4–1·6 mm. longa, lateralia carinata. *Petala* subpatentia, ovata vel ovato-oblonga, 1·4–1·5 cm. longa, 6–7 mm. lata. *Labellum* trilobum, 1 -1·2 cm. longum ; lobi laterales oblongi, apice late ovati, obtusi, non falcato-divergentes, 3 mm. lati ; lobus intermedius late ellipticus vel ovato-ellipticus, obtusus, 6 mm. latus ; discus basi 2-lamellatus, apice 5-lamellatus, lamellis valde fimbriato-verrucosis ; calcar oblongum vel clavatum, subrectum vel curvatum, 4–5 mm. longum. *Columna* clavato-oblonga, 6 mm. longa. *E. hians*, Rolfe in Dyer Fl. Cap. v. iii. p. 32, ex parte (non Spreng.)

South Africa. Transvaal ; Ermelo, *Watkinson.* Musidora, near Barberton, grassy mountain slopes, 1065–1220 m. *Galpin* 509. Swaziland, *Miss Stewart* 42.

A plant sent from Ermelo (with a corresponding dried specimen) by Mr. H. Watkinson, of the Transvaal Forest Department, flowered at Kew in February, 1913, and proved to have bright yellow flowers with a little brown outside the sepals. It is identical with specimens collected by Galpin and by Miss Stewart, also with a drawing by Mrs. Barber from an unknown locality, which have hitherto been referred to *E. hians*, Spreng., a widely distributed species with purple or lilac and purple flowers. The two closely resemble each other in a dried state. Mrs. Barber's drawing shows the sepals entirely dark brown.

403. **Eulophia ugandae**, *Rolfe ;* affinis *E. latifoliae*, Rolfe, sed pseudobulbis longioribus et labelli calcare clavato differt.

Caules scandentes. *Pseudobulbi* superpositi, subfusiformes, apice attenuati, 2–3-phylli, basi radices crassas emittentes, vaginis tubuloso-spathaceis obtecti. *Folia* petiolata ; limbus ovatus vel elliptico-ovatus, subacutus, subcoriaceus, 8–11 cm. longus, 3·5–4·5 cm. latus ; petioli 2–3 cm. longi. *Scapi* 12–20 cm. longi, vaginis spathaceis obtecti, apice paniculati ; panicula compacta, multiflora. *Bracteae* oblongo-lanceolatae, acutae, 4–5 mm. longae. *Pedicelli* 8 mm. longi. *Flores* parvi. *Sepala* et *petala* subconniventia, oblonga, subobtusa, 8 -9 mm. longa. *Labellum* trilobum, 7 -8 mm. longum ; lobi laterales oblongi, obtusi ; lobus intermedius late obovatus, emarginatus, subundulatus, 3 mm. longus 4 mm. latus ;

discus obscure 2-carinatus, laevis ; calcar clavatum, apice globoso-inflatum, 3 mm. longum. *Columna* clavata, 5·5 mm. longa.

Tropical Africa. Uganda ; Mabira Forest, *E. Brown* 443. "A terrestrial plant. Flowers blue."

Flowered in the collection of Sir Trevor Lawrence, Bart., Burford, Dorking, in March, 1913, the plant having been sent by Mr. E. Brown, who also sent a dried specimen to Kew. How far the flowers vary in colour is uncertain, but those sent by Sir Trevor Lawrence are white, with a few purple radiating nerves on the lip, and a few purple streaks on the face of the column. The climbing habit is remarkable, the new bulbs being regularly produced from above the base of the old one, and sending down a strong root, thus recalling a mangrove in habit.

404. **Lissochilus uliginosus**, *Rolfe* ; affinis *L. purpurato*, Lindl., sed labello latiore et lobo intermedio late ovato differt.

Rhizoma incrassatum. *Folia* non vidi. *Scapi* 1 m. vel ultra longi, erecti, validi, basi vaginis tubulosis obtecti ; racemi circiter 30 cm. longi, laxi, multiflori. *Bracteae* anguste lineares, acuminatae, 1·5–2 cm. longae. *Pedicelli* subgraciles, 2·5 cm. longi. *Sepala* patentia, undulata ; posticum ovato-oblongum, subobtusum, 1·5 cm. longum ; lateralia oblonga, obtusa, 2 cm. longa. *Petala* oblonga, obtusa, undulata, circiter 2 cm. longa, sepalis lateralibus paullo angustiora. *Labellum* trilobum, fere 2 cm. longum ; lobi laterales erecti, semiovato-oblongi, obtusi, 8 mm. longi ; lobus intermedius ovatus, obtusus, crenulato-undulatus, 1·2 cm. longus, 1 cm. latus, incurvus ; discus carinis 5 crassiusculis et obtuse verrucosis instructus ; calcar conicum, subacutum, circiter 7 mm. longum. *Columna* clavata, apiculata, 7 mm. longa.

Tropical Africa. Gold Coast Colony : Western Province ; Chama, in grassy fresh water swamps in savannah forest, *Chipp* 192.

405. **Polystachya coriacea**, *Rolfe* ; a *P. golungensi*, Reichb. f., foliis latioribus, scapo brevioribus et floribus minoribus differt.

Herba epiphytica, 15–18 cm. alta. *Pseudobulbi* oblongi, 2·5–3 cm. longi, diphylli. *Folia* lineari-oblonga, bidentata, subconniventia, crasso-coriacea, 10–14 cm. longa, 1·3–1·5 cm. lata. *Scapi* 7–9 cm. longi, basi vaginis spathaceis angustis imbricatis obtecti ; racemi basi interdum sparse ramosi, 3–4 cm. longi, densiflori, rachi pubescente. *Bracteae* triangulari-oblongae, subacutae, 1 mm. longae. *Pedicelli* 2 mm. longi. *Flores* minuti. *Sepalum* posticum ovato-oblongum, subobtusum, concavum, 1·5 mm. longum ; sepala lateralia triangularia, acuta, 2 mm. longa ; mentum obtusum, 1·5 mm. longum. *Petala* lineari-oblonga, obtusa, 1·5 mm. longa. *Labellum* obovato-oblongum, trilobum, 2 mm. longum ; lobi laterales rotundato-oblongi, 0·5 mm. longi ; lobus intermedius suborbicularis, emarginatus, 1 mm. latus ; discus pulverulento-pubescens. *Columna* lata, 0·5 mm. longa.

British Central Africa.

Flowered in the collection of Mr. James Bush, Bryn Asaph, Romilly Road, Cardiff, in March, 1913. The flowers are deep yellow in colour.

406. **Xylobium elatum,** *Rolfe* ; a *X. scabrilingui*, Rolfe ; sed foliis et scapis multo longioribus et floribus numerosissimis differt.

Pseudobulbi ovoideo-oblongi, 5–7·5 cm. longi, diphylli. *Folia* longe petiolata ; limbus lanceolatus vel elliptico-lanceolatus, acutus, plicatus, 40–50 cm. longus, 8–10 cm. latus ; petiolus 20 cm. longus. *Scapus* 90 cm. altus, vaginis spathaceis paucis obtectus ; racemus circiter 18 cm. longus, multiflorus. *Bracteae* lineari-lanceolatae, acuminatae, 1·5–2 cm. longae. *Pedicelli* 2–2·3 cm. longi. *Sepala* oblonga, subobtusa vel apiculata, 1·6–1·8 cm. longa ; lateralia subfalcata ; mentum obtusum, 3–4 mm. longum. *Petala* oblonga, subobtusa, 1·4–1·5 cm. longa. *Labellum* 3-lobum, 1·2 cm. latum, fere omnino prominenter tuberculato-papillosum ; lobi laterales obtusi vel truncati, erecti ; lobus intermedius elliptico-oblongus, obtusus, carnosissimus ; discus callo oblongo laevi instructus. *Columna* lata, 6–7 mm. longa, marginibus angulatis.

Peru. *L. Forget.*

Introduced by Messrs. Sander & Sons, and flowered in their Establishment at Bruges, Belgium, in May, 1913. It is characterised by its tall habit, the scape being as much as three feet high and the leaves correspondingly large. The flowers are dull pale green, heavily marbled with brown on the back of the segments ; the very prominent tubercles on the lip are dark brown.

407. **Xylobium ecuadorense,** *Rolfe* ; a *X. foveato*, Nichols., floribus minoribus, labello latiore et carinis ternis differt.

Pseudobulbi ovoideo-oblongi, 5–6 cm. longi, apice diphylli. *Folia* petiolata, arcuata, elliptico-lanceolata, acuminata, 13–20 cm. longa. *Scapi* suberecti, subgraciles, 12–15 cm. longi, squamis paucis lanceolatis obtecti. *Bracteae* angustissime lineares, acuminatae, 1·5–2·5 cm. longae. *Pedicelli* graciles, 1·5 cm. longi. *Sepalum* posticum lanceolatum, subacutum, 1·5 cm. longum ; lateralia falcato-lanceolata, subacuta, dorso carinata, 1·5 cm. lata, basi cum columnae pede in mentum conicum 5 mm. longum extensa. *Petala* falcato-lanceolata, subacuta, 1·2 cm. longa. *Labellum* obovato-oblongum, prope apicem trilobum, 1·2 cm. longum ; lobi laterales anguste oblongi, apice obtusi ; lobus intermedius obovato-quadratus, emarginatus, 4 mm. latus. *Columna* clavata, 8 mm. longa.

Ecuador. Naranajapata, about 75 miles from the coast, 300 m., *L. J. Lipscomb.*

Sent for determination by Mrs. Lipscomb, Wilton Grove, Wimbledon, who informs us that it was sent from Ecuador by her son, Mr. Lancelot J. Lipscomb, in 1911. The flowers are uniformly light yellow in colour.

408. **Trichocentrum panamense,** *Rolfe* ; a *T. capsicastro*, Linden et Reichb. f., scapis paucifloris et labelli calcare breviter quadrilobo differt.

Herba epiphytica, parva, epseudobulbosa. *Folia* lineari-oblonga, obtusa, carnosa, 4–7·5 cm. longa, 1–1·8 cm. lata. *Scapi* horizontales, flexuosi, 4–6 cm. longi, pauciflori. *Bracteae* conduplicatae, ovatae, acutae, 6–8 mm. longae. *Pedicelli* circiter 1 cm. longi. *Flores* parvi. *Sepala* et *petala* subconniventia, oblongo-lanceolata, subacuta, subconcava, circiter 2·3 cm. longa. *Labellum* elliptico-oblongum, obtusum, conduplicato-concavum, 1·2 cm. longum, basi margini columnae adnatum ; calcar breve, dilatatum, 2 mm. longum, apice

breviter quadrilobum. *Columna* crassa, 5 mm. longa ; alae falcato-oblongae, obtusae, integrae, 4 mm. longae, 3 mm. latae ; anthera insigniter papilloso-cristata.

Panama. On bush-covered hills east of the Panama Canal, 255 m., *L. J. Lipscomb.*

Flowered in the collection of Mrs. Lipscomb, Wilton Grove, Wimbledon, in November, 1911, the plant having been received some two years previously from Mr. Lancelot J. Lipscomb. The species is anomalous in the shape of the spur, which is very short, dilated, and divided at the apex into four short lobes. The flowers are light green, with a white lip, at the base of which is situated a red-purple blotch. The spur is yellowish and there are a few minute purple dots on the column-wings.

409. **Sigmatostalix bicornuta**, *Rolfe* ; habitu *S. gramineae*, Reichb. f., sed labello multo latiore, et petalis basi dente conico brevi instructis differt.

Planta caespitosa, circiter 6 cm. alta. *Pseudobulbi* elliptico-oblongi, subcompressi, circiter 1 cm. longi, apice monophylli, basi tetraphylli. *Folia* linearia, subobtusa vel minutissime denticulata, basi conduplicata, 3–5 cm. longa, 1·5–2 cm. lata. *Scapi* laterales, graciles, 4–5 cm. longi, pauciflori. *Bracteae* fasciculatae, 3–4, elliptico-lanceolatae, acutae, 2–3 mm. longae, pedicellos involventes. *Pedicelli* 2–3 mm. longi. *Flores* parvi. *Sepala* lineari-lanceolata, subacuta, reflexa, 3–3·5 mm. longa ; lateralia sublibera. *Petala* lineari-lanceolata, subacuta, apice subrecurva, 3–3·5 cm. longa, facie prope basin dente conico brevi instructa. *Labellum* sessile, subpatens, reniformi-orbiculare, minute apiculatum, 4 mm. latum, margine recurvo et crenulato, basi et medio callo carnoso transverso nitido instructum. *Columna* clavata, 2·5 mm. longa, basi gracilis.

Peru. *L. Forget.*

Imported by Messrs. Sander & Sons, and flowered in the Royal Botanic Garden, Glasnevin, in January, 1912, whence it was sent by Sir F. W. Moore for determination. The flowers are yellow, with a deep purple-red stripe on the dorsal sepal and petals. The specific name refers to the two fleshy conical horns on the petals, a quite unusual character.

410. **Saccolabium glomeratum**, *Rolfe* ; a *S. penangiano*, Hook. f., racemis brevioribus et congestis, floribus fere duplo majoribus et labelli calcare oblique clavato differt.

Herba epiphytica. *Caulis* circiter 20 cm. altus. *Folia* disticha, patentia vel subrecurva, lanceolata, acuminata, valde coriacea, circiter 9 cm. longa, prope basin 1 cm. lata. *Racemi* axillares, brevissimi, subglomerulati, 2–2·5 cm. longi, congesti, multiflori, rachi pubescente. *Bracteae* lineares, subacutae, incurvae, valde concavae, 4 mm. longae. *Pedicelli* pubescentes, 6 mm. longi. *Flores* parvi. *Sepalum* posticum cuneato-oblongum, acutum, incurvum, valde concavum, 4 mm. longum ; sepala lateralia subconniventia, ovata, subobtusa, 3·5 mm. longa. *Petala* subpatentia, lanceolato-oblonga, subobtusa, 3·5 mm. longa. *Labellum* valde carnosum, trilobum ; lobus intermedius linearis vel subfiliformis, acutus, recurvus, 2–2·5 mm. longus ; lobi laterales lati, 1·5 mm. longi, columnae adnati, apice profunde bidentati, dentibus acutis ; calcar valde carnosum,

late oblongum, apice oblique clavatum, 5–6 mm. longum, intus nudus. *Columna* latissima, 2·5 mm. longa ; antherae stipes superne late triangulari-dilatatus.

BORNEO.

Flowered in the collection of the Hon. N. C. Rothschild, Ashton Wold, Oundle, in October, 1913. The flowers are yellow, spotted with brownish red on the sepals and petals, and striped with similar colour on the side lobes of the lip.

LV.—NEMATODES OR EELWORMS.

G. MASSEE.

(With plate.)

Nematodes or Eelworms belong to the class Vermes, which includes earthworms ; the latter, however, are much more highly organised than eelworms. Tape worms and liver flukes are also closely related. Nematodes are very numerous and widely distributed in nature. The majority of species are saprophytes, and abound in stagnant water, decaying vegetable matter, manure, soil in damp places, &c. The vinegar eelworm, *Anguillula aceti*, is a well-known example of this group. The saprophytic species are not at all injurious to living animals or plants, and may be looked upon as scavengers in a small way, causing the disintegration of organic matter, and rendering it once more available for plant life. On the other hand, certain nematodes are parasitic on animals or plants. *Trichina spiralis* forms very minute, white, chalky looking lumps in the flesh of pigs, and was the cause of a scare some years ago, when it was reported that the parasite might prove a source of danger to human beings ; many kinds of worms infesting human beings are also nematodes. The majority of nematodes are long and slender or eel-like in shape during some stage of their development, hence the popular name, eelworm, this, however, is merely a book-name, as with few exceptions they are so very minute that they cannot be seen with the naked eye. Not more than half-a-dozen kinds of eelworms are destructive to plants in this country, but the amount of acknowledged injury caused by their presence is enormous, and it is practically certain that many diseases usually attributed to other causes are primarily due to eelworms. As an example, several diseases of violets, especially when grown in frames, and usually attributed to fungi, are in reality due to the presence of eelworms in the root, where they form minute galls, which contort and destroy the continuity of the water-conducting cells. The plant is as a consequence deprived of the necessary amount of water and food, and the foliage is inclined to wilt, when it is readily attacked by various kinds of fungi, which have been proved by experiments to be unable to infect normal and healthy violet plants.

A quarter of a century ago, with a few notable exceptions such as rust of wheat, &c., fungi were not credited with being active agents in causing injury to plants ; at the present day the pendulum has

swung to the opposite extreme, and fungi are gravely suspected as being the cause of almost every important disease attacking plants of economic value. Epidemics caused by fungi among wild plants in a state of nature are practically unknown. It will, I believe, be generally admitted that plants cultivated under glass are much more susceptible to attacks from fungi than when the same kinds of plants are grown out of doors, in fact I usually fail to infect plants growing in the open with spores obtained from the same kinds suffering from an epidemic when grown under glass. A good deal of evidence could be given on the same lines, to show that fungi are not so much to blame as is usually supposed for being the primary cause of plant diseases. Experience has proved that fungi undoubtedly are the cause of an enormous loss to cultivators of plants, either as primary or secondary agents, and as the injury caused by the fungus is much more obvious than that produced by the primary cause, it is usually concluded that the injury is entirely due to the fungus, whereas in reality, but for the road being made clear by the primary agent, the fungus, which completes the work of destruction, could not have gained a foothold. For the above reasons I am led to consider that attention to fungi alone is but a poor equipment for a post as plant pathologist, and will not leád to a reduction of the losses caused indirectly by fungi, which can never be exterminated.

Among the known primary agents which enable the large class of fungi known as wound-parasites or facultative parasites to gain an entrance into plant tissues may be enumerated insects of various kinds, which by eating, and more especially by simply puncturing the tissues, enable the germ-tubes of spores to gain a foothold, at first by obtaining food from the injured cells and living as saprophytes, then gradually assuming a parasitic habit and invading the living tissues of the host-plant. In many instances not only do insects—aphides, mites, scale-insects, &c., enable the fungus to gain an entrance into a plant, but they also unconsciously carry and deposit the spores of the fungus in the punctures made. Injury caused to young leaves and tender shoots by hail is frequently followed by an epidemic, fungus spores germinating readily on the bruised tissues. Climatic conditions are a most important factor in determining the presence or absence of epidemics due to fungi; marked contrasts in temperature during the spring months invariably mean an excess of injury caused by fungi, whereas an equable temperature during the same period is marked by a comparative absence of disease. The same applies if extremes of temperature occur between day and night in conservatories, &c. I have frequently cultivated fungi, *Botrytis*, *Fusarium*, *Trichothecium*, that have commenced their parasitic career in old, partly decomposed nodules on the roots of leguminous plants.

The above remarks, of course, apply to the great number of fungi oscillating between parasites and saprophytes, and which only become true parasites under special circumstances. The extension of disease due to fungi is favoured in many ways by modern methods of cultivation as the marked extension of fungi in space is facilitated by rapid transit. In this respect opportunity is a factor of primary importance. I think it may be stated, without fear of contradiction, that no living

organism, in a state of nature, enjoys the opportunity of performing all that it is capable of doing. The constant struggle for existence, or whatever phrase be preferred, that compels every animal and plant to be content with the mean, or give and take policy, prevents the accomplishment of such an ideal. Even the fittest, judged from the standpoint of number of individuals and distribution in space, are amendable to opportunity. If this argument be sound, it follows that the extension of disease amongst cultivated plants, nay even the creation of new diseases, due to fungi, should be great, as the opportunities indirectly and unknowingly, to most people, are many and far reaching. As it has been abundantly demonstrated, that the education of a saprophytic fungus to change its nature, and become a rampant parasite, is a simple matter in the laboratory, it may be assumed that when facilities are offered outside the laboratory the same change would be effected. Among such opportunities for ordinarily saprophytic fungi to change their mode of life may be mentioned the constant wounding of plants, due to careless planting, "heeling in," grass-cutting machines injuring roots, pruning, &c. The principal reason why there are no epidemics due to fungi in virgin forests and uncultivated places is because host and parasite have lived together for an indefinite period of time, and by a process of elimination the survivors are able to live side by side without either being capable of exercising any very marked superiority. On the other hand, when a new and strange plant is introduced into a virgin forest or to a new country the inevitable epidemic caused by fungi follows. The new importation being altogether unprepared to combat an enemy of which it has had no previous experience at first falls a victim, but as the process of elimination of the least resistent goes on, the epidemic subsides. It is a well-known fact that in the majority of instances the initial period of an epidemic attacking a plant for the first time is most severe after which it gradually subsides. Why? When the hollyhock disease first appeared in Europe it rendered the cultivation of that plant well-nigh impossible. To-day hollyhocks are again in cultivation, and although the rust is present it does no material harm, although the opportunities for infection are ample, in fact much more so than when the epidemic first appeared, as the disease is now met with on malvaceous plants throughout Europe. Again, why? Those elusive conditions of the host-plant appear to offer the most promising field for research, where the primary object is that of reducing the loss directly or indirectly due to fungi. Judging from results, the so-called life histories of fungi, apart from the host, are not likely to lead to the desired result.

To return to eelworms.

Heterodera radicicola, *Mull.*, the gall-forming eelworm, is best known, and does the greatest amount of damage in this country. The egg is large in size, compared with the worm, colourless, elliptic-oblong, about $\frac{1}{250}$ of an inch in length. The covering is very thin and translucent, so that at a certain stage the minute worm can be distinctly seen in its interior. Although so thin the wall is very tough and resistant to extremes of heat and cold, chemical substances, &c., and the germ is with difficulty killed. The worm usually escapes from the egg in the gall, and is a tiny

eel-like body quite invisible to the naked eye. The young worms soon find their way into the soil, when they at once proceed to attack any other rootlets that may be present. Should the rootlets not be forthcoming, according to Stone and Smith, they are capable of existing for a considerable time without change, awaiting an opportunity for further development. Having effected an entrance into a young root, aided by means of a moveable spear-like body situated within the mouth-opening, and the whole body becoming immersed in the tissues, the worm comes to rest, and undergoes some remarkable changes. Briefly, in both males and females the body becomes swollen at the centre until it is spindle-shaped. Afterwards the male again assumes an eel-like form, whereas the female continues to enlarge and becomes more or less lemon-shaped. At this stage fertilisation is supposed to take place, after which the males perish, and the stationary females produce numerous eggs in their interior. When the eggs are mature the female dies. Sections of a gall at this stage shows the more or less spherical bodies of the females crowded with eggs, the body showing as a whitish speck to the naked eye. Usually several bodies of distended females may be seen in one section, as they are more or less gregarious in habit. The swollen portions or galls vary much in size on different plants. On vine roots they are usually small, rarely exceeding the size of a pea; on the tomato they are frequently the size of a marble, whereas on some plants the galls are as large as a walnut or even larger. The galls are always formed on the root or on some underground part of the plant. In a section through a gall the vascular bundles and water-conducting vessels will be seen to present a contorted and dislocated appearance. When galls are numerous on the root, as is usually the case, the root is prevented from performing its function of supplying the above-ground portion with water containing food substances in solution, consequently the plant literally dies of hunger and thirst, as is also the case when the passage of water is interrupted by the presence of fungus mycelium in the tissues of the root and collar.

There appears to be little or no discrimination in the choice of a food-plant by nematodes; Kühn, a German observer, enumerates a list of 180 plants, belonging to 39 orders; amongst these grasses are most favoured, 46 species being attacked by eelworms; Leguminosae 33 kinds, &c. Eelworms may be commonly found infesting wild grasses in this country, hence the popular idea that turf from an old pasture is perfectly free from eelworms and other pests, is not necessarily correct.

In this country cucumbers and tomatoes suffer most severely from the ravages of eelworms; this, however, is not due to any special preference on the part of eelworms for these plants, but is simply due to the method of cultivation under glass, where the soil becomes infected, and only half-hearted measures are adopted for the purpose of securing immunity from a pest admittedly difficult to exterminate. Among other plants of economic importance attacked by *H. radicicola* are vines, potatoes (tubers), roses, Phloxes and Balsams; less frequently fruit trees are attacked; but, as already stated, in the case of stunting of the foliage, the absence of thriftiness,

or wilting, the presence of eelworms in the root may be suspected, whatever kind of plant may be concerned. The most obvious indication of the presence of eelworms is the galled or knotted appearance of the root. This, however, is but a suggestion, and should be corroborated by microscopic examination, as galls on the root may be due to other causes. For example, the swellings on the roots of cabbages, caused by the cabbage root fly, *Phorbia brassicae*; finger-and-toe, on the roots of various cruciferous plants, due to the presence of *Plasmodiophora brassicae*, &c. Tubercles are normally present on the roots of leguminous plants, but galls formed by nematodes may often be found intermixed on the same root.

So far as preventive or curative methods are concerned, there is no known method by which the eggs of eelworms can be killed in open ground, and even when treating a limited amount of soil in houses, the most drastic measures, accurately applied, can alone command success. The reason why eelworms are so difficult to exterminate arises from the fact that eggs are produced in immense numbers throughout the year, or at all events so long as living roots are available, and young eelworms are constantly being liberated into the soil, consequently the dressing capable of killing eelworms should be repeated for a considerable number of times, extending over a long period of time, which becomes almost impracticable. A dressing of sulphate of potash, 3 cwt. per acre, will kill all active eelworms with which it comes in contact, and however well it may be worked into the soil many will escape, and its efficacy soon passes away. When, however, a growing crop is suffering from eelworm, the application of sulphate of potash, if at a sufficiently early date, will check the progress of the disease to some extent, but it will not prove a permanent cure, since the eggs are not destroyed. The application of lime is practically useless against eelworm. Gaslime, now hardly procurable, is a more satisfactory remedy, as its lasting power in the land means the death of successive generations, but to obtain this end the land must lie fallow for some time. The use of a " trap crop " is advocated by German experts, where the injury to sugar-beet by eelworm is often considerable. The idea of a trap crop is to grow on infected land some plant readily attacked by eelworms, the crops should be pulled up and sun-dried, if practicable, when a considerable number of larval nematodes have entered the roots, and before a new brood is produced; summer rape is recommended for this purpose, on account of its quick growth and great spread of root. Success of course entirely depends on the removal of the crop at the proper time. This method so far reduces the number of eelworms present in the land that a fairly good crop may be secured, but its effect is not lasting.

For the complete destruction of eelworms in soil in tomato and cucumber houses, &c., the method recommended by Stone and Smith is as follows :—

" The most effectual, complete, and practical method at the present time of exterminating nematodes in greenhouses is by heating the soil by means of steam. This can be accomplished without much expense providing proper attention is paid to the method of applying the steam. A pressure of steam exceeding 50 lbs. is not only

cheaper but more effective than a pressure which falls below this, and the amount and cross section area of the tile [pipe] is important. The cost of heating soil depends upon the equipment employed and cost of labour, &c. Probably not far from 100 cubic feet of soil under the most favourable conditions can be heated in one hour's time to a temperature of over 200° F. The minimum amount of heat necessary to kill nematodes and their eggs while confined to the soil is about 140° F., but for all practical purposes it is desirable to make use of a higher temperature, at least from 180°–212° F. The benefit of steaming or sterilising soil is not alone confined to nematodes. Many other greenhouse pests are killed. The mechanical conditions of the soil are moreover greatly improved, the numerous compounds are rendered more available for plant food, which results in giving plants grown in a sterilised soil a considerable acceleration in their rate of growth." Full details and plans relating to the sterilisation of soil by steam, are given in Bull. No. 55, Hatch Experiment Station, Mass., U.S.A.

It has been suggested that dressing the soil with rape meal destroys eelworms. This may possibly hold in check or kill active eelworms, but it will not kill the eggs.

It is well known that a poor physical condition of the soil not only favours the spread of eelworms, but also prevents their destruction, owing to the difficulty of diffusion and permeation of the remedial agent applied.

Potassium permanganate, 1 part in 200 parts, kills eelworms, if the soil is saturated at intervals of ten days, and does not injure growing plants. This again may be used to save a growing crop, but as it has no effect on the eggs, it must not be depended upon for exterminating the pests. Finally, carbon bisulphide injected into the soil will kill any active eelworms present.

Heterodera schachtii, *Schm.*—The sugar beet eelworm differs from *H. radicicola* in not forming galls or knots on the roots of the host-plant. The young females only penetrate the peripheral layer of the rootlet, and on increasing in size burst through to the surface, remaining attached by a narrowed portion only, hence an attacked rootlet presents a knotted appearance, figs. 1 and 8, the knots being the external distended females and not galls of plant tissue. *H. schachtii* is a serious pest in the sugar beet fields in Germany, but up to the present, so far as I am aware, has not been recorded on sugar beet in this country. Quite recently, however, *H. schachtii* has proved destructive to potatoes in Scotland, where the rootlets are attacked in a similar manner to the rootlets of sugar beet, fig. 8. This discovery is of some importance, as plants belonging to *Solanaceae*, *Papaveraceae*, *Compositae* and *Umbelliferae* respectively are stated by Voigt to be free from the attacks of this pest. Potatoes have been recommended for growing on infested beet-growing land, along with a trap crop of rape, for the double purpose of obtaining a crop and reducing the number of eelworms at the same time. It certainly would not be wise to follow this course in Great Britain. It may be stated that *Oospora scabies*, a fungus causing a scab on potato tubers, also attacks sugar beet, which is an additional reason why these two crops should not alternate, as *O. scabies*

when once introduced into the land is somewhat difficult to eradicate. When sugar beet is attacked in the seedling or young stage, the formation of a tap-root is arrested, and several long, slender rootlets take its place, to which numerous distended female eelworms are attached, fig. 1. This eelworm has been observed on about 50 different kinds of plants, among which may be mentioned, mangolds, cabbages, radish, spinach, *Agrostemma githago*, &c. The treatment for the destruction of this eelworm is the same as for *H. radicicola*.

Tylenchus devastatrix, *Ritzema Bos*, is a third eelworm which often proves very injurious to several outdoor crops. Clover sickness, which is frequently attributed to the exhaustion of some ingredient of the soil necessary for the growth of clover, is in reality caused by this eelworm. The symptoms are a yellowing of small, usually scattered patches; these patches gradually increase in size, and according to the severity of the attack, and the rate of spread of the eelworms through the soil, the crop becomes more or less involved. In the end the attacked plants become brown and dead, leaving bare patches in the field. A clover plant infested with eelworms presents a very characteristic appearance. The branches, where they spring from the root, are very much swollen and often distorted, whereas in the normal plant the branches are thin and wiry. A section through the swollen part reveals the presence of female eelworms or their eggs. If the diseased patches are observed when quite small, dig up the plants and burn them on the spot when dry, taking care to remove the plants well beyond the zone of apparent injury. Then dress with sulphate of potash as previously advised.

"Segging" of oats, or "Tulip root," is also caused by *Tylenchus devastatrix*. The symptoms are the swollen appearance at the base of the culm, which bears a number of swollen distorted shoots. Diseased plants remain stunted and eelworms or their eggs will be found in the swollen parts. Deep ploughing, where allowable from other standpoints, and treatment by sulphate of potash are recommended for infected land, which should not be sown with a crop susceptible to the disease such as clover. Barley or root crops are safe.

Microscopic examination is necessary for the certain determination of the presence of eelworm, as the base of the culm in oats is also swollen in a similar manner when attacked by the frit fly (*Oscinis frit*).

The same eelworm is the cause of a disease of the strawberry plant. The plants rot and decay at the ground level and the leaves are often crinkled and deformed at an early stage. Diseased plants should be removed and burned, and the land treated with sulphate of potash.

Aphelenchus fragariae, *Ritzema Bos.* is the cause of a second disease of strawberry plants, known as the "cauliflower" disease, Diseased plants present a fasciated appearance, the stems and leaves being consolidated into an irregular fleshy mass, suggesting

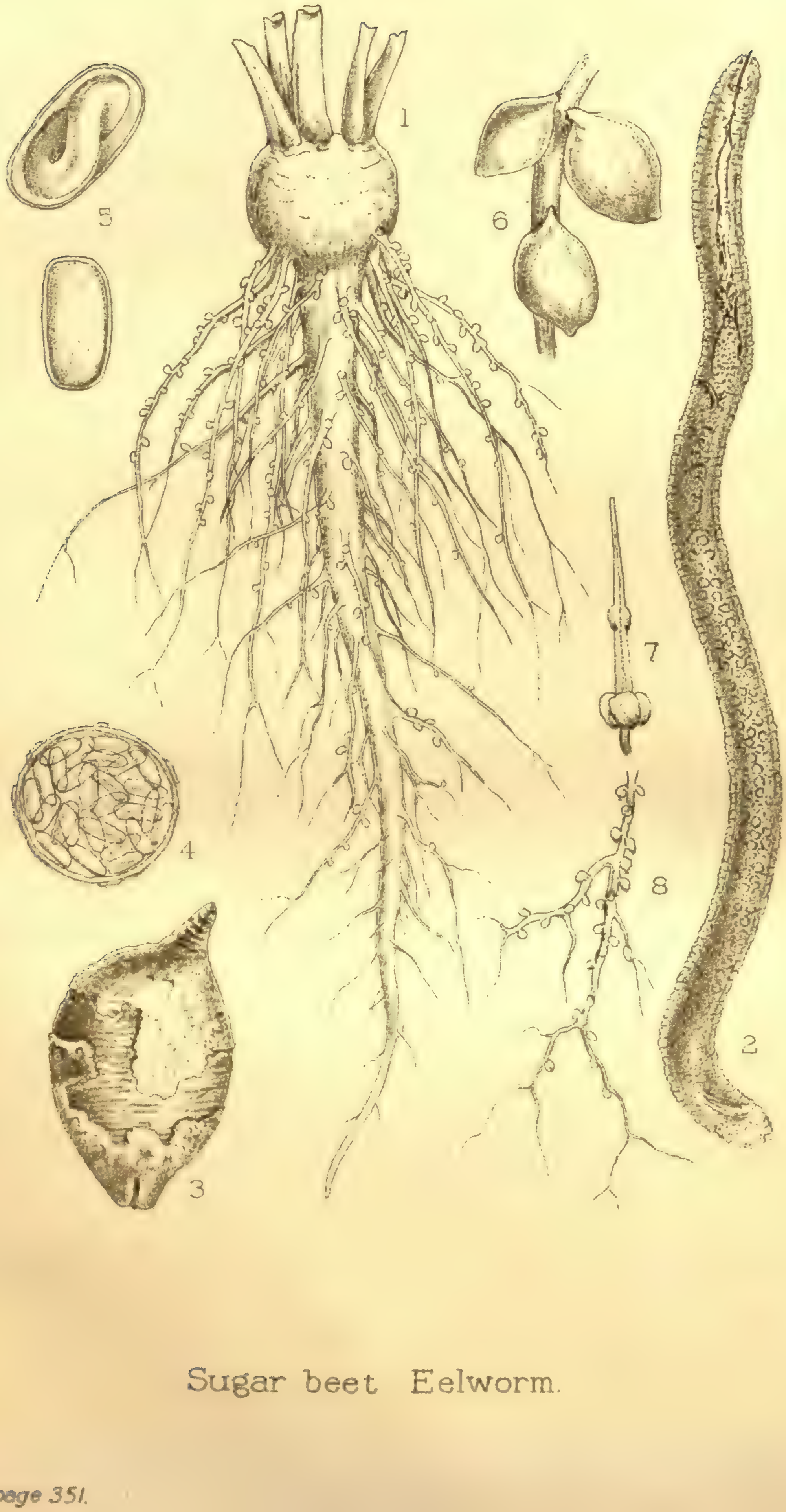
a cauliflower. The flowers also assume monstrous forms. Diseased plants should be removed and sulphate of potash applied.

Tylenchus tritici, *Bastian*, the cause of "Ear-cockles" of wheat, is sometimes responsible for a considerable shortage of the wheat crop. The grain, which is the part attacked, becomes changed into a roundish, blackish-purple mass, somewhat smaller in size than a normal grain. As a rule almost every grain in the ear is attacked. When a diseased grain is crushed and examined under the microscope numerous eelworms will be seen wriggling about in a characteristic manner. A similar temporary wriggling occurs when infected grains, that are over fifty years old and have been kept perfectly dry all the time, are crushed and placed in water. This was at one time supposed to demonstrate the extreme vitality of life under desiccation. Such eelworms, however, are dead, and the wriggling is simply due to the absorption of water by their desiccated bodies, which causes them to expand. When the body of an eelworm is once saturated with water and properly expanded all movement ceases. This phenomenon is clearly shown in specimens of "earcockle" grains included in a pioneer work on plant diseases, by Edwin Sidney, entitled "Blights of the Wheat, and their remedies," 1846.

When infected grains are sown together with healthy ones, they become soft, and the eelworms escaping into the ground make their way to the sprouting wheat, and insert themselves under the leaf-sheaths, where they remain until the ear begins to develop; when they enter the soft, young grain, and a gall or ear-cockle results.

If seed grain containing ear-cockles is placed in water, and well stirred up, the lighter, diseased grains float, and can be skimmed off.

Aphelenchus olesistus, *Ritzema Bos*, the Fern eelworm, forms brown streaks or patches on the living fronds of various kinds of ferns. The shape of the brown patches is determined by the venation of the particular fern attacked. Where the veins are more or less parallel, as in *Lygodium*, *Pteris*, &c, the blotches are long and narrow, extending from the mid-rib to the margin of the pinnule; where the veins anastomose irregularly the blotches are more or less angular. This is due to the fact that the eelworms in the tissues of a fern frond cannot penetrate beyond the portion circumscribed by a vein. When the air is moist the eelworms leave old patches and enter adjoining healthy parts through the stomata. When the air is fairly dry, this migration is checked. In addition to ferns, this eelworm attacks the leaves of many kinds of flowering plants, *Chrysanthemum*, *Begonia*, *Calceolaria*, *Gloxinia*, *Coleus*, &c, forming more or less extended brown patches, frequently mistaken for the injury done by *Thrips*. This eelworm breeds in the soil, and enters the leaves of the plants for food only. Treating the soil with carbon bisulphide kills the eelworms, but not their eggs, hence the treatment must be constantly repeated until the pest is exterminated. Dusting the under surface of the leaves, and more especially the stems near the ground, with a mixture of tobacco powder and flowers of sulphur, when moist, will prevent the eelworms from ascending and entering the tissues.



Sugar beet Eelworm.

To face page 351.

Aphelenchus olesistus has caused considerable trouble in the fern houses at Kew. A short account of this eelworm was given in *K.B.*, 1909, pp. 243, 244, and the accompanying text figure is reproduced from that volume. *Aneimia collina*, *Pteris Droogmantiana*, *Adiantum Capillus-veneris*, and *Lygodium volubile* have been among the ferns more particularly attacked.

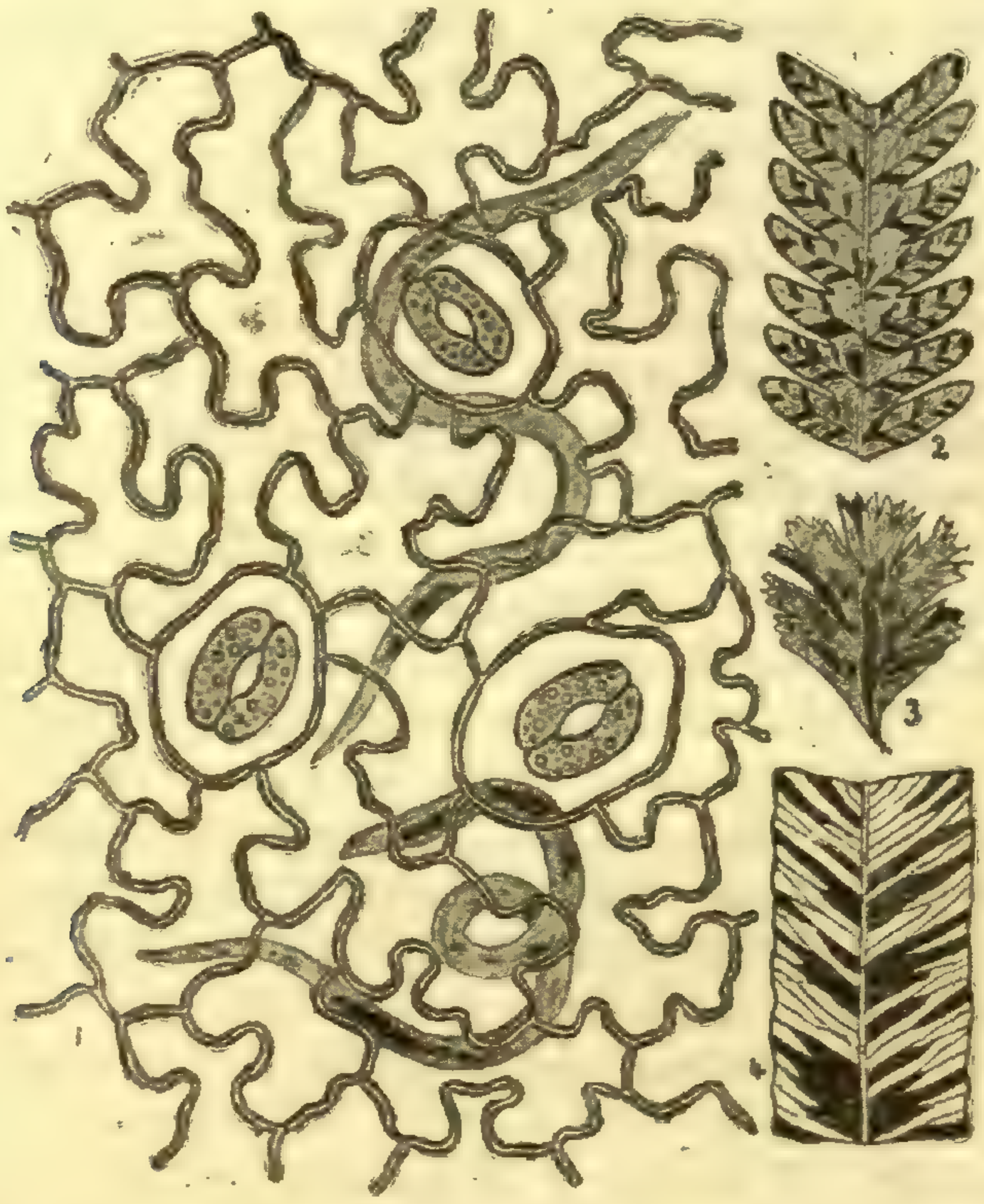


Fig. 1. *Aneimia collina*, Raddi, showing the eelworms in the tissue of the frond under the epidermis × 300.

Fig. 2. *Pteris Droogmantiana*, L. Linden. The dark streaks are caused by the eelworm.

Fig. 3. *Adiantum Capillus-veneris*, f. *fissa*, showing dark patches due to eelworm.

Fig. 4. *Lygodium volubile*, Sw., with dark streaks caused by eelworm.

Explanation of Figures in Plate.

Heterodera schachtii, Schm.

1. Young sugar beet attacked by eelworm. Nat. size.
2. Male of sugar beet eelworm. × 500.
3. Female of sugar beet eelworm. × 500.
4. Section of female of same filled with eggs. × 500.
5. Eggs of same in different stages of development. × 1200.
6. Female eelworms of sugar beet attached to rootlet of sugar beet. × 250.
7. Spear, or piercing apparatus of eelworm. × 1200,
8. Sugar beet eelworm on rootlets of potato. Nat. size.

LVI.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS LXXXV.

731. **Bauhinia comosa,** *Craib* [Leguminosae-Caesalpineae]; ab affini *B. saxatili*, Craib, racemis densioribus, rhachi pedicellisque crassioribus, legumine latiore recedit.

Ramuli breviter tomentelli, brunneo-corticati. *Folia* ambitu late ovata vel suboblonga, basi late cordata, ad 7·5 cm. longa et 6·4 cm. lata, circiter ad medium biloba, lobis obtusis ad 3·5 cm. longis et latis, rigide chartacea, supra ima basi excepta glabra, subtus primo tenuiter adpresse pubescentia, mox plus minusve glabrescentia, 9-nervia, nervo mediano in apiculum tenuem ad 5 mm. longum excurrente, nervulis uti reticulatione supra conspicuis vel subprominulis subtus prominulis, petiolo ad 1·7 cm. longo suffulta. *Racemi* densiusculi, ad 28 cm. longi, pedunculo communi 1·7–2·3 cm. longo indumento ut rhachi ramulisque suffulti; pedicelli sub anthesin 6 mm., infructescentes 1 cm. longi, breviter densius pubescentes; bracteae deciduae, 6 mm. longae, bracteolis geminis 4 mm. longis. *Calycis* tubus vix 2 mm. longus; segmenta 5 mm. longa, 2 mm. lata, dorso adpresse pubescentia. *Petala* lutea (ex *Henry*), anguste oblonga, acuminata, vix 6 mm. longa, 1·5 mm. lata, inferne in unguem brevem contracta. *Stamina* 3, filamentis 6 mm. longis glabris, antheris in alabastro 2 mm. longis, staminodiis minutis. *Pistillum* glabrum; ovarium 3 mm. altum, 6–8-ovulatum, stipite 1·25 mm. longo suffultum, stylo circiter 2 mm. longo. *Legumen* compressum, 7·3 cm. longum, 2·1 cm. latum, stipite 2·5 mm. longo suffultum.

China. Yunnan: Linan, 1350 m., *Henry* 13,358.

732. **Bauhinia genuflexa,** *Craib* [Leguminosae-Caesalpineae]; *B. Henryi*, Craib, facie similis sed ramulis fusco-corticatis, alabastris angulum circiter 90° cum pedicellis efficientibus distinguenda.

Ramuli primo sparse adpresse pubescentes, mox glabri, fusco-corticati. *Folia* ambitu subrotundata, basi cordata, ad 5 cm. longa et 5·3 cm. lata, apice biloba, lobis rotundatis ad 1 cm. longis et 2·4 cm. latis, rigide chartacea, 7-nervia, nervis subtus prominentibus, nervulis uti reticulatione gracili pagina utraque conspicuis, supra glabra, subtus nervis parcissime adpresse pubescentia et ima basi in nervorum axillis ferrugineo-pubescentia; petioli 1–2·3 cm. longi, supra canaliculati, fere omnino glabri; stipulae 2·5 mm. longae, 0·75 mm. latae, superne falcatae, glabrae. *Corymbi* ad 4 cm. longi et 6·5 cm. diametro, rhachi, pedicellis alabastrisque plus minusve adpresse ferrugineo-pubescentibus; pedicelli ad 2·7 cm. longi; bracteae 6·5 mm. longae, bracteolis geminis alternis 4–5 mm. longis; alabastra ellipsoidea, angulum circiter 90° cum pedicellis efficientia. *Calycis* tubus basi gibbosus, 5 mm. longus; segmenta 5 mm. longa, 2 mm. lata. *Petala* albo-viridia (ex *Morse*), inter se inaequalia, ad 6 mm. longa et 5·5 mm. lata, ungui ad 2 mm. longo suffulta, dorso pilosa. *Stamina* 3, filamentis 6·5 mm. longis glabris,

antheris rubris (ex *Morse*) in alabastro 2·5 mm. longis. *Ovarium* 3 mm. altum, inferne suturis ferrugineo-pubescens, stipite 2 mm. longo ferrugineo-pubescente suffultum; stylus 3 mm. longus, glaber.

China. Kwangsi: Lungchow; Sim Kee gorge, *Morse* 408.

733. **Bauhinia Henryi**, *Craib* [Leguminosae-Caesalpineae]; a *B. touranensi*, Gagnep., ovario distincte stipitato recedit.

Ramuli juventute fere glabri, mox omnino glabri, cortice pallide brunneo nitido vel subnitido obtecti. *Folia* ambitu subrotundata, basi cordata, ad 6·2 cm. longa et 6·8 cm. lata, biloba, lobis rotundatis ad 1·8 cm. longis et 2·8 cm. latis, chartacea, supra glabra, subtus in nervorum axillis pubescentia, 7–9–nervia, nervis supra conspicuis subtus prominentibus, reticulatione utrinque gracili, petiolo 1·2–1·7 cm. longo suffulta. *Corymbi* ad 4 cm. longi et 6 cm. diametro; pedicelli 2·4 cm. longi; bracteae 6 mm. longae, bracteolis geminis alternis 3–4 mm. longis. *Calyx* ut pedicelli adpresse pubescens; tubus sulcatus, 5 mm. longus, basi gibbosus; segmenta 6 mm. longa, 2 mm. lata. *Petala* inter se inaequalia, 6–9 mm. longa, 3–5 mm. lata, ungui 2–3·5 mm. longo suffulta, dorso pilosa. *Stamina* 3, filamentis glabris 1 cm. longis, antheris in alabastro 2·5 mm. longis, staminodiis parvis. *Ovarium* 4 mm. altum, suturis ferrugineo-pubescens, circiter 20–ovulatum, stipite 2·5 mm. longo adpresse ferrugineo-pubescente suffultum; stylus 3·5 mm. longus, glaber.

China. Yunnan: Manpan; Red River Valley, 450 m., *Henry* 10,175.

734. **Bauhinia saxatilis**, *Craib* [Leguminosae-Caesalpineae]; a *B. Championii*, Benth. alabastris longius acuminatis, ovario glabro, a *B. Harmsiana*, Hosseus, racemis laxioribus, ovarii stipite glabro distinguenda.

Ramuli graciles, circiter 2 mm. diametro, primo pallide mox ferrugineo- adpresse pubescentes, sulcati. *Folia* ambitu late ovata, oblonga vel subquadrata, basi late cordata vel truncato-cordata, ad 4·8 cm. longa et lata, ad medium vel plerumque paulo ultra medium biloba, lobis divergentibus triangularibus apice obtusis vel rotundatis ad 2·5 cm. longis et 2·4 cm. latis, chartacea, supra primo parcissime adpresse pallide pubescentia, mox ima basi excepta glabra, subtus, inferne praecipue, adpresse pubescentia, plus minusve glabrescentia, 9–nervia, nervis supra conspicuis vel prominulis subtus prominentibus, mediano in apiculum ad 4 mm. longum excurrente, nervulis uti reticulatione supra subprominulis subtus prominulis, petiolo 1–2·8 cm. longo ut ramulis pubescente suffulta; stipulae fugaces, 3 mm. longae. *Racemi* ad 24 cm. longi, breviter pedunculati, pedunculo rhachi pedicellisque ut ramulis pubescentibus; pedicelli sub anthesin graciles, 1 cm. longi, infructescentes conspicue incrassati, 1·3 cm. longi; bracteae deciduae, 4 mm. longae, bracteolis binis alternis circiter pedicelli medium positis ad 3 mm. longis; alabastra acuminata, ad 6·5 mm. longa et 2·5 mm. diametro, adpresse, superne densius, pubescentia. *Calycis* tubus 2 mm. longus; segmenta late lanceolata, acuminata, 6·5 mm. longa, 2 mm. lata. *Petala* alba (ex *Henry*), ad 7·5 mm. (ungui incluso) longa et 2 mm. lata, oblonga, basi in unguem brevem contracta, dorso medio adpresse brunneo-pubescentia. *Stamina* 3, filamentis 8 mm. longis glabris, antheris

in alabastro 2 mm. longis, staminodiis parvis. *Pistillum* glabrum; ovarium 4 mm. altum, 1·5 mm. latum, 7-ovulatum, stipite vix 2 mm. longo suffultum; stylus 4 mm. longus. *Legumen* compressum, apiculatum, ad 7·3 cm. longum et 1·7 cm. latum, brunneum, stipite 3 mm. longo suffultum.

China. Yunnan: plain to north of Mengtze; low shrub trailing over rocks, 1350 m., *Henry* 10,193.

735. **Diospyros Tutcheri**, *Dunn* [Ebenaceae]; species *D. affini*, Thwaites, affinis sed calyce 4-fido distincta.

Arbor parva (?), cortice fusco rugoso; ramuli cito glabri. *Folia* elliptica, ad apicem angustata, acuminata, basi obtusa, 8–12 cm. longa, mox omnino glabra, utrinque reticulata, costis nervisque lateralibus 5–6-paribus supra paullo depressis subtus prominenter elevatis; petioli 0·5–1 cm. longi. *Flores* dioecii; *masculi* in pedunculos racemosos 1–3-mm. dispositi; rachis basi dense sericea, ad 2 cm. longa; pedunculi 3–4 mm. longi; pedicelli 5–6 mm. longi, sparse sericei, prope apicem articulati. *Calyx* 4-partitus, 1–2 mm. longus, lobis patulis triangularibus. *Corolla* urceolata, 7–8 mm. longa, extus dense pallide sericea, intus apice puberula, lobis 4 tubo 8-plo brevioribus reflexis late ovatis. *Stamina* circiter 16, per paria basi breviter dorsi-ventraliter coalita: antherae glabrae, rimis apicalibus brevibus dehiscentes; filamenta breviter hirsuta. *Pistilli* rudimentum parvum hispidum. *Flores foeminei* solitarii, ex axillis foliorium novorum nutantes; pedunculi 1·3–1·5 cm. longi, sericei. *Sepala* 4, 8 mm. longa, ovata, extus sericea, erecta, in fructu paullo elongata, patentia; corolla late urceolata, 5 mm. longa, ore contracto, lobis 4 tubo brevioribus, utrinque tomentella; staminodia 4, linearia, 3 mm. longa. *Ovarium* depresso-globosum, 3 mm. longum, loculis 8, 1-ovulatis. *Fructus* globosus, 2 cm. diametro (nondum maturus), glaber. *Semina* **matura non visa.**

China. Hongkong Island: Mt. Gough; in watercourses on south side, male and female flowers in March, *Hongkong Herb.* 8218; fruit in October, *Hongkong Herb.* 9995. Both sets were collected by Mr. W. J. Tutcher, Superintendent of the Botanical and Forestry Department, Hongkong.

736. **Chlamydoboea**, *Stapf* [Gesneraceae-Streptocarpeae] gen. nov.; affine *Boeae*, Lam., sed sepalis membranaceis superne dilatatis obtusis in alabastro late imbricatis, corolla suboblique saccato-companulata, filamentis basi sigmatoideo-curvatis anthera longioribus, inflorescentia strobilacea bracteis magis minusve rotundatis amplis munita distinctum.

Calyx 5-sepalus; sepala paulo inaequalia, membranacea, superne dilatata, obtusa, in alabastro late imbricata. *Corollae* tubus brevis, late campanulatus, antice subsaccatus; limbus vix bilabiatus, lobis subaequalibus rotundatis brevibus. *Stamina* 2 antica perfecta, inclusa, supra basin corollae inserta, caetera ad staminodia brevia filiformia redacta; filamenta e basi tenui descendente curvato-erecta, incrassata, intus papillosa; antherae apicibus cohaerentes, loculis inaequalibus, postico majore basi subacuto producto, rimis apice confluentibus. *Discus* annularis. *Ovarium* superum, lineare, ob placentas valde intrusas bifidas imperfecte 4-loculare; stylus brevissimus; stigma 2-lobum; ovula numerosa, margines placentarum revolutas in facie exteriore dense obtegentia. *Capsula*

anguste cylindrica, subuliformis, spiraliter torta, secundum nervos interplacentares dehiscens, basi apiceque haud fissa. *Semina* minuta, oblonga, utrinque minute apiculata.—Herbae *perennes*, *caulescentes*, *tenuiter pannoso-tomentellae*. Folia *opposita*, *petiolata*, *plerumque approximata*. Pedunculi *axillares*. Cymae *multiflorae*, *primo tamen arcte congestae*, *strobilaceae*, *demum paulo solutae*, *bracteis amplis tarde deciduis instructae*. Flores *mediocres*, *roseae vel lilacinae*.

Species unica asiae tropicae orientalis.

C. sinensis, *Stapf*, comb. nov. et descr. emend.

Caulis brevis vel ad 20 cm. altus, ascendens, inferne nudus, cicatricibus foliorum delapsorum obsitus et irregulariter flexuosus nodosusque cinnamomeo-tomentellus. *Foliorum* lamina lanceolato-oblonga, rarius elliptico-oblonga, basi breviter vel longe acuta, apice breviter acuminata, subintegra vel crenulata, 7–13 cm. longa, 3–5 cm. lata, supra primo arachnoideo-lanata, mox glabrescentia, viridia, infra cinnamomea, tenuiter pannoso-tomentella, nervis lateralibus infra prominentibus utrinque 9–12 ; petiolus longitudine varians, ad 6 cm. longus. *Inflorescentiae* sub anthesi ad 3–5 cm. diametro, postea magis minusve solutae ; pedunculi 3–7 cm. longi ; rami subumbellatim vel corymbose dispositi, inaequales, longiores demum ad 2·5 cm. longi ; pedicelli ad 1 cm. longi, uti omnes inflorescentiae axes primo tamen magis minusve araneoso-pilosi ; bracteae infimae saepe connatae, majores ad 2 cm. diametro, omnes inferne vel altius albae, superne viridescentes, apice purpureae, inferne lana detersili instructa, caeterum glabra. *Sepala* spatulata vel spatulato-oblonga, 1–3 cm. longa, superne 4–6 mm. lata, praeter apicem saepe purpurascentem alba. *Corolla*, lobis 5 mm. longis inclusis, 1·6–2 cm. longa, albida, lilacina vel rosea. *Capsula* glabra, circiter 4 cm. longa, 2 mm. diametro. *Phylloboea sinensis*, Oliv. in Hook. Ic. Pl. tab. 1721.

China. Hupeh : Ichang ; on cliffs, *Henry* 1572, 3958, 4158, 6017 ; without exact locality, May, 1900, *Wilson* 854.

Burma. Northern Shan State : Gokteik Gorge, 450 m., *Lace* 4158.

Forma **macrophylla**, *Stapf*. *Caules* ad 90 cm. alti. *Foliorum* laminae 12–27 cm. longae, 4·5–12 cm. latae, ellipticae vel oblongo-ellipticae, rarius late lanceolatae, margine subintegrae, nervis lateralibus utrinque ad 15. *Inflorescentiae* magis compactae, demum minus solutae.

China. Yunnan : Mengtze, on wooded cliffs, 1800 m., *Henry* 11,223A. Szemao, in forests, 1200–1500 m., *Henry* 12,162A, 12,162B, 12305 ; mountain forests, 1800–2100 m., *Hancock*.

Forma **macra**, *Stapf*. *Caules* plerumque humiles. *Foliorum* laminae ad 7 cm. longae, ad 4 cm. latae. *Inflorescentiae* 5–2-florae.

China. Yunnan : Manmei ; south of the Red River, 1800 m., *Henry* 9630 ; Mengtze, 1800 m., *Henry* 9836.

Phylloboea differs from *Chlamydoboea* very considerably in its thinly membranous leaves, peculiar green foliaceous glandular calyx, whose posticous sepals are fused into a trilobed lip, short filaments and straight short capsules which, apart from the subulate style measuring 4 mm. in length, do not exceed 1 cm. The plate representing *Phylloboea amplexicaulis* in Clarke's *Commelynaceae et*

Cyrtandraceae Bengalenses, (tab. 84) shows the capsules twisted, but there is no trace of this condition in Parish's specimens, nor does Parish in his unpublished figure of the plant represent them so. It is true, those capsules had not yet dehisced when collected, but they contain almost mature seeds. In *Chlamydoboea* and *Boea* the twisting sets in at a very early stage of the development of the fruit.

737. **Dichiloboea**, *Stapf* [Gesneraceae-Streptocarpeae], gen. nov.; affine *Phylloboeae*, Benth. et *Boeae*, Lam., ab illa calyce haud foliaceo, inflorescentia, capsulis jam in statu immaturo spiraliter tortis, indumento pannoso-tomentoso distinctum, ab hac sepalis posticis in labium integrum vel breviter 3-lobum connatis, corolla oblique campanulata, stigmate filiformi distinctum.

Calyx 2-labiatus, persistens; sepala 2 antica linearia, libera, 3 postica in labium integrum vel breviter 3-lobum connata. *Corolla* oblique campanulata, more *Digitalis*; limbus vix 2-labiatus, lobis brevibus rotundatis, posticis extimis, antico intimo quam lateralibus minore. *Stamina* antica perfecta, inclusa, prope basin corollae inserta, caetera ad staminodia minuta filiformia redacta; filamenta arcuato-ascendentia, basi haud attenuata; antherae apicibus contiguae, loculis aequalibus divergentibus, rimis apice confluentibus. *Discus* annularis, *Ovarium* superum, lanceolatum vel lineare, ob placentas valde intrusas bifidas imperfecte 4-loculare; stylus brevis, in stigma integrum filiforme vel subliguliforme prorsus curvatum vel flexuosum tota longitudine papillosum productus; ovula numerosa, margines placentarum revolutas in facie exteriore dense obtegentia. *Capsula* subulato-cylindrica, firma, mox spiraliter torta, secundum nervos interplacentares dehiscens, demum saepe apice soluta, valvis binis. *Semina* minute asperula.—Herbae *monocarpicae* (?), *albo-pannosae*. Folia *opposita*, *petiolata*, *lanceolata*, *oblonga vel elliptica*, *crassiuscula*. Inflorescentiae *axillares et terminales*, *pedunculatae*, *sympodiales*, *e racemis spuriis flores geminatos gerentibus vel fasciculis florum inaequaliter pedicellatorum et ramulorum pseudo-racemosorum constituti*. Flores *mediocres*, *coerulei vel albidi*.

Species 2, Asiae tropicae orientalis.

D. speciosa, *Stapf*, comb. nov. et descr. emend.; ab altera specie *D. birmanica*, Stapf (*Boea birmanica*, Craib), foliis supra glabris, bracteis latis, floribus geminatis sessilibus vel subsessilibus majoribus, calycis labio superiore integro, capsulis pannoso-lanatis distinctissimus.

Caulis 30–60 cm. altus, angulatus, tenuissime tomentosus. *Folia* distantia, lanceolata, utrinque acuta, ad 10 (vel teste *Ridley* ad 15 cm.) longa, 2–3 cm. (vel ultra) lata, irregulariter crenulata, supra glabra, subtus albido-pannoso-tomentosa, nervis subtus prominulis utrinque circiter 12; petiolus ad 2–2·5 cm. longus. *Inflorescentiae* racemos spurios paucifloros referentes, floribus geminatis, uno sessili, altero breviter pedicellato, bracteis oppositis late circumdatis; pedunculi ad 7 cm. longi; bracteae late rotundato-ovatae, acutae vel breviter acuminatae, ad 1·5 cm. longae, carnosulae, albido-pannosae; pedicelli longiores, demum ad 5 mm. longi. *Calyx* extus albido-pannosus, intus glaber, circiter 1 cm. longus; sepala libera lanceolato-oblonga; labium superum integrum, naviculare, in

apiculum cucullatum breve productum. *Corolla* coerulea, glabra, 12-15 cm. longa ; lobi vix 3 mm. longi, lati, subcrenulati. *Filamenta* 3–4 mm. longa, antheras aequantia. *Ovarium* dense albo-pannosum ; stylus cum stigmate flexuoso demum ultra 1 cm. longus. *Capsula* pannosa, ad 1·5 cm. longa, 3·5 mm. diametro, valvis solutis ad 4 mm. latis.—*Phylloboea speciosa*, Ridley in Journ. Linn. Soc. xxxii (1895), 522 et in King and Gamble Mat. Fl. Mal. Penins. 990 (Journ. As. Soc. Beng. lxxiv, ii (1907), 780).

Malay Peninsula. Kedah : Langkawi ; common on limestone rocks on the small islands, *Curtis* 2564.

738. **D. birmanica**, *Stapf*, comb. nov. et descr. emend. ; a *D. speciosa*, Stapf, foliis supra tomentosis, bracteis angustioribus, floribus in cymarum ramis solitariis vel quum geminatis altero longe pedicellato, corolla minore, calycis labio superiore 3-dentato, capsulis glabris differt.

Caulis ad 40 cm. altus, subangulatus, araneoso-pannosus. *Folia* distantia, oblonga vel elliptica, utrinque acuta, rarius obtusiuscula, basi in petiolum magis minusve anguste decurrentia, minute crenulata, 4–12 cm. longa, 2–6·5 cm. lata, supra tomentosa, subtus albido-pannoso-tomentosa, nervis venisque subtus prominentibus, illis utrinque 7–8 ; petioli 1–8 cm. longi, illi unius paris basi commissura connexi, aequales vel inaequales. *Inflorescentiae* saepe per totum caulem dispositae, racemos spurios paucifloros plerumque binos cum floribus binis in paniculam vel umbellam spuriam collectos referentes, floribus solitariis vel quum geminatis tunc uno subsessilli altero longe pedicellato, bracteis oppositis circumdatis ; pedunculi breves vel ad 5 cm. longi ; bracteae oblongae vel ovatae, subacutae vel obtusae, 10–6 mm. longae, 4–3 mm. latae, crassiusculae, supra virides, tomentosae, subtus albido-pannosae ; pedicelli longiores, 1–1·5 cm. longi. *Calyx* extus albido-pannosus, intus glaber, 9 mm. longus ; sepala libera, sublinearia, obtusa ; labium superum apice tridentatum, subnaviculare. *Corolla* alba, glabra, fere 1 cm. longa ; lobi 3·5 mm. longi latique, subaequales. *Filamenta* 3–4 mm. longa, antheris paulo longiora. *Ovarium* glabrum ; stylus cum stigmate prorsus curvato demum ad 1 cm. longus. *Capsula* glabra, 1·5–2·4 cm. longa, fere 3 mm. diametro, fusco-brunnea.—*Boea birmanica*, Craib in Kew Bull., 1913, 114.

Burma. Maymyo Plateau, 1050 m., *Lace* 5882.

China. Yunnan : Szemao ; on cliffs and in forests, 1500–1800 m., *Henry* 12,305 A, 13,112 ; Puerh, 1500 m., *Henry* 13,396.

739. **Dischidia Micholitzii**, *N. E. Brown* [Asclepiadaceae-Marsdenieae] ; affinis *D. acuminatae*, Cost., sed foliis ellipticis vel elliptico-ovatis abrupte acuminatis basi rotundatis, umbellis pedunculatis et coronae lobis bifidis conspicue differt.

Caulis volubilis, gracilis, minutissime et sparse adpresse puberulus, fusco-purpureus, internodiis 2–6 cm. longis. *Ascidia* nulla. *Folia* opposita ; petiolus 3–5 mm. longus, 1–5 mm. crassus, puberulus ; lamina 2·5–3·8 cm. longa, 1·7–2·7 cm. lata, elliptica vel elliptico-ovata, apice abrupte acuminata, basi rotundata, carnosa, supra plana, subtus leviter convexa, glabra, viridis, plus minusve sordide purpureo-tincta. *Umbellae* axillares, multiflorae. *Pedunculi* 5–8 mm. longi, glabri. *Bracteae* minutissimae, dentiformes. *Pedicelli* 3–3·5 mm. longi, glabri. *Calyx* 5-lobus, glaber ; lobi 1·5 mm.

longi, ovati, obtusi. *Corolla* 6–6·5 mm. longa, urceolata, extra glabra, intra fauce barbata; tubus basi ovoideo-inflatus, 3·5 mm. diametro, carneus, purpureo-vittatus; lobi breves, erecti, acuti, virides. *Coronae* lobi erecti, albi, subhyalini, 1 mm. longi, bifidi, lobis incurvo-recurvatis subellipticis obtusis canaliculatis. *Staminum* columna 2 mm. longa, conica, fusco et luteo-variegata, glabra.

Locality unknown, but probably Burma; collected by *Micholitz* and presented by Messrs. F. Sander & Sons in 1913 to Kew, where it flowered on May 14th.

740. **Rhodospatha Forgeti**, *N. E. Brown* [Aroideae-Calleae]; affinis *R. costaricensi*, Engl., sed vagina petioli integra, spatha et spadice multo longiore, spadice tenuiore breviter stipitato, ovario multo breviore differt.

Caulis scandens. *Folia* patula, glabra; petiolus circa 30 cm. longus, ad geniculum vaginatus, marginibus vaginae integris; lamina 40–50 cm. longa, 14–15 cm. lata, oblongo-lanceolata, apice subabrupte angustata et breviter cuspidato-acuminata, basi late cuneata, supra viridis, subtus subflavo-virens, venis primariis lateralibus 30–32 supra impressis subtus prominentibus. *Pedunculus* circa 15 cm. longus, 1 cm. crassus, pallide viridis. *Spatha* 15 cm. longa, 9–10 cm. (explanata) lata, late elliptica, extra sordide pallide-roseo-alba, intra sordide rosacea. *Spadix* 12 cm. longus, 1·4 cm. crassus, cylindricus, obtusus, stipite 4–5 mm. longo et 8–9 mm. crasso suffultus, pallide rosaceus. *Ovaria* 3 mm. longa, apice 2·5 mm. lata, 4–5-angulata, truncata, stigmate atro-fusco anguste oblongo coronata; loculis multiovulatis.

Costa Rica. Without precise locality, *Forget*.

Described from a living specimen communicated by Messrs. F. Sander & Sons of St. Albans, who received the plant from Mr. Forget whilst collecting for them in Costa Rica.

LVII.—MISCELLANEOUS NOTES.

Mr. George Bryce, M.A., B.Sc., of the University of Edinburgh, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Mycologist and Botanist in the Department of Agriculture, Ceylon.

Mr. Godfrey E. Coombs, B.Sc., of University College, Reading, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Economic Botanist in the Department of Agriculture of the Federated Malay States.

Mr. F. T. Brooks, M.A., Senior Demonstrator in Botany in the University of Cambridge, has been appointed by the Secretary of State for the Colonies, Mycologist in the Department of Agriculture of the Federated Malay States for one year.

We learn that Mr. W. Nowell, Assistant Superintendent of Agriculture in Barbados, has been appointed by the Secretary of State for the Colonies, Mycologist and Agricultural Lecturer in the Imperial Department of Agriculture for the West Indies, in succession to Mr. F. W. South (*K.B.*, 1913, p. 125).

Mr. Frank Gordon Walsingham, a member of the gardening staff of the Royal Botanic Gardens, has been appointed, on the recommendation of Kew, Assistant Director of Horticultnre in the Egyptian Department of Agriculture.

Osmunda from St. Petersburg.—Kew is highly indebted to the Director of the Imperial Botanic Garden of Peter the Great, St. Petersburg, for a remarkably fine specimen of the Royal Fern, *Osmunda regalis*, L. The specimen presented to Kew is one of several obtained from near Adler in the Sotshi district of the Caucasus, which are among the glories of the St. Petersburg Garden. An illustration of one of these plants, very similar in size to the one now at Kew, was given in *K.B.*, 1913, p. 249.

The following note by Prof. Fischer de Waldheim in Bull. Jard. Imp. Petersburg, iv., 1904, p. 69, gives interesting particulars about one of these remarkable ferns.—"Towards the end of 1903 the Garden received a very precious gift from M. Scriwanek, a living example of a plant of *Osmunda regalis*, L., more than a thousand years old. It was found in a forest near Adler in the Caucasus on the shores of the Black Sea. The trunk above the surface of the soil is nearly three metres in circumference, half a metre high and carries fourteen more or less strong branches nearly 35 cm. in length. The branches have produced leaves of extraordinary vigour."

The plant presented has a large, massive, woody rootstock, with a circumference of 5 feet at the base, rising to a height of 2 feet 6 inches which has branched into eight distinct stems, with ten separate crowns, all of them furnished with strong fibrous rootlets. The stems extend horizontally, thus giving the plant a breadth of 3 feet 2 inches. At present the plant is without fronds as these have been cut off for convenience of packing.

These remarkable Osmundas more nearly resemble in general appearance old specimens of *Todea barbara* than any other fern, and since the two genera are nearly allied it may be of interest to compare the dimensions of the *Osmunda* with the large plant of *Todea* now growing in the Temperate House.

The *Todea* has a breadth of 3 feet 6 inches at the base, and is 2 feet in height, with eighteen crowns, while many of the fronds are 8 feet in length.

W. T.

Presentation of Orchids.—The Kew collection of orchids has been enriched by the presentation of a valuable collection of healthy, well-grown plants by Mrs. Sheppee, of Holly Spring, Bracknell.

These orchids represent a portion of the collection formed by the late Colonel Sheppee, an orchid enthusiast of no mean order. Upwards of 260 plants have been received, many of them being handsome specimens, and among the rarer species there are some which were not represented at Kew. Of the more interesting of these may be mentioned *Dendrobium sanguineolentum* var. *album*, *Zygosepalum rostratum* and *Arundina bambusaefolia*. The collection includes 26 species of *Dendrobium* and a number of the best hybrids. The specimens of *Angraecum eburneum*, *A. Leonis*, *A. sesquipedale*, *Peristeria elata* and *Vanda Sanderiana*, and a fine healthy specimen of *Cyrtopodium punctatum* are particularly worthy of notice. Other genera represented in the collection by one or more species are *Masdevallia*, *Miltonia*, *Lycaste*, *Thunia*, *Zygopetalum*, *Anguloa*, *Catasetum*, *Coelogyne*, *Cattleya*, *Laelia*, *Phalaenopsis* and *Trichopilia*.

C. P. R.

Bust of Sir J. D. Hooker.—On 14 July, 1913, Lady Hooker addressed the following letter to the Director :—"May I ask your "acceptance on behalf of the Royal Botanic Gardens, of a Bust of "my late husband Sir Joseph Dalton Hooker ? The clay model was "taken from life by Mr. Pennacchini, in the autumn of 1911 ; "from this a marble bust has lately been completed and it may, I "hope, find an appropriate place in the Institution at Kew, to the "interests of which he devoted the best years of his life."

Lady Hooker very kindly accepted an invitation to pay a visit to Kew with a view to the selection of the most appropriate position for the bust. The spot decided upon is in Museum No. I, where there already is a bust, by Thomas Woolner, R.A., of Sir W. J. Hooker, father of Sir J. D. Hooker and predecessor of Sir Joseph in the post of Director of Kew.

In accordance with an undertaking entered into at the time of this visit the bust of Sir Joseph Hooker was conveyed to Kew by the artist himself and placed in the position decided upon, under his supervision, on 12 August, 1913.

Index Kewensis, Supplement IV.*—The appearance of the fourth supplement to the Index Kewensis continues that work to the end of the year 1910. Compared with the two preceding quinquennial supplements, the one just issued exhibits a notable increase in size, containing 252 pages as against 204 and 193 respectively in the second and third supplements. The plan of the work remains the same with a few exceptions. The most important difference is that the present supplement is now a register of names without any reductions, no opinion being expressed as to the validity of the genera and species included in it. The genera are referred to the

* Index Kewensis Plantarum Phanerogamarum Supplementum Quartum, nomina et synonyma omnium generum et specierum ab initio anni MDCCCCVI usque ad finem anni MDCCCCX nonnulla etiam antea edita complectens, ducta et consilio D. Prain confecerunt Herbarii Horti Regii Botanici Kewensis Curatores. Oxonii, e prelo Clarendoniano. MDCCCCXIII.

families to which they were assigned in de Dalla Torre et Harms, Genera Siphonogamarum, the name of the family according to Bentham and Hooker's Genera Plantarum being added where different. The geographical distribution of new species is stated, but in the case of new combinations only the synonym is given. Numerous names accidentally omitted from previous supplements are included, and others are re-inserted in cases where the reference originally given was not the earliest.

T. A. S.

Botanical Magazine for November.—The plants figured are *Alocasia Micholitziana*, Sander (t. 8522); *Rhododendron setosum*, D. Don (t. 8523); *Senecio Kirkii*, Hook. f. (t. 8524): *Coriaria terminalis*, Hemsl. (t. 8525) and *Streptocarpus orientalis*, Craib (t. 8526).

Alocasia Micholitziana is a near ally of the well-known *A. Sanderiana*, Bull, but may be easily distinguished from that species by its smaller very rarely peltate leaves, which are less deeply lobed at the margins and are of a deeper and very different shade of green, without silvery borders to the almost straight primary lateral veins. It is a native of the Island of Luzon, Philippines, where it was first discovered by Mr. A. Loher. Its introduction to cultivation was effected by Mr. Micholitz about three years ago, when collecting on behalf of Messrs. Sander & Sons, of St. Albans.

Rhododendron setosum is a neat-growing species, only about one foot high, with small rather sparingly lepidote leaves and clusters of rose-purple flowers about $\frac{3}{4}$-inch long. The corolla is 5-lobed to within $\frac{1}{3}$-inch of the base. It is a native of the rocky slopes of the loftier passes leading across the Eastern Himalaya into Tibet, and is remarkable for the heavy resinous aroma which it exhales after hot sunshine. The species is rarely met with in gardens, apparently being short-lived. The material for the illustration was obtained from Sir Edmund Loder's garden at Leonardslee, Horsham.

Senecio Kirkii is endemic in the North Island of New Zealand, where it occurs from sea-level to an elevation of 2500 feet, and is one of the many interesting plants introduced into this country from New Zealand and the neighbouring islands by Capt. A. A. Dorrien-Smith. It is a shrubby species, 7–15 feet high, with linear-oblanceolate or obovate leaves, and large corymbs, sometimes as much as 3 feet across, of white flower-heads, $1\frac{1}{2}$–2 inches in diameter. The plant flourishes in Mr. T. A. Dorrien-Smith's gardens at Tresco Abbey, Isles of Scilly, whence material for the figure was obtained.

Coriaria terminalis, a native of China, Tibet and Sikkim, is a sparingly branched shrub, with opposite entire ovate leaves and long terminal racemes of insignificant flowers, which are followed by very ornamental orange-yellow 'fruits'—the fleshy petals—about $\frac{1}{4}$-inch long. The material for the figure was contributed by Canon Ellacombe, in whose garden at Bitton, near Bristol, *C. terminalis* and other species of the genus grow vigorously.

Streptocarpus orientalis is interesting as being the only Asiatic representative of a genus hitherto supposed to be limited to Africa south of the Tropic of Cancer and to the Mascarene Islands. It

was originally described about two years ago from material which was included in the rich collections made by Dr. A. F. G. Kerr, near Chiengmai, Siam. Seeds were sent to Kew by Dr. Kerr in 1912, and from these the plant now figured was raised. The species is caulescent, with membranous ovate or elliptic-ovate leaves 1–3½ inches long, and a racemose cyme, ultimately 10 or 12 inches long, of purple flowers.

A New Work on Conifers.*—We have received a copy of this excellent and profusely illustrated work, recently published under the editorship of Count Ernst Silva Tarouca and Dr. Camillo Schneider, President and Secretary respectively of the Dendrological Society of Austria-Hungary. There is scarcely a page without an illustration, many pages have two, and the attractiveness of the volume for the general public is enhanced by twelve reproductions of photographs in colour. There are also six folded plates devoted to the delineation in black and white of cones, chiefly those of *Pinus*, *Abies* and *Picea*. The usefulness of the volume for purposes of identification is increased by numerous engravings of leaves, leaf-sections, buds, cone-scales, etc. On the whole it is probably the most comprehensively illustrated volume on conifers in existence. The pinetum of Mr. G. Allard (*K.B.*, 1913, p. 316) has supplied a large number of subjects for illustration, and the Vilmorin collections at Verrières and Les Barres in France, and the Royal Gardens at Sans Souci and Dresden, as well as Mr. Hesse's nursery at Weener, have supplied the editors with much foreign material for illustration. The unrivalled pinetums in the British Isles possess much finer examples than many published in this volume, but for a work in German and intended primarily for Austrian and German use, a series of pictures taken in Central Europe is, no doubt, of more interest and value than those would be made in our milder insular climate.

The first part of the work is devoted to a general discussion of the family. The editors deal with the landscape value of conifers in park and garden; Mr. E. H. Wilson writes of Chinese conifers; Mr. A. Rehder on North American ones. Cultivation and propagation are discussed by Mr. Franz Zeman.

The second part is devoted to an analytical key of the whole family, followed by descriptive notes on species and their varieties. The genera are alphabetically arranged, but the species and varieties follow each other according to relationship. To students acquainted with the German language, this volume supplies a mass of condensed information of the greatest value respecting one of the most important and fascinating families in the Vegetable Kingdom.

W. J. B.

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* Unsere Freiland-Nadelhölzer. Vienna, F. Tempsky; Leipsic, G. Freytag. With 14 coloured plates, numerous half-tone reproductions of photographs and engravings.

Marram Grass for Paper-making.—A note appeared in *K.B.*, 1912, p. 396, directing attention to the value of Marram grass (*Ammophila arundinacea*, Host.), for the manufacture of paper, with the results of certain experiments carried out by Messrs. Clayton Beadle and Stevens.

A further series of experiments have been conducted by the same firm, the results of which are appended.

Messrs. Clayton Beadle and Stevens write :—" We have extended our experiments in the direction of the utilisation of the above fibre [Marram grass] for the purpose of paper-making and the following are the results obtained :—

" On green stem as received—

Yield of dry uncrushed fibre	56·4	per cent.
Yield of boiled unbleached (bone dry) fibre	17·7	,,
,, ,, ,, bleached ,, ,, ,,	13·1	,,
Percentage of ash	2·08	,,
Soda consumption (NaOH)	6·85	,,
Bleach consumption (bleaching powder)	2·03	,,

" On dry stem—

Yield of boiled unbleached fibre ...	31·4	,,
,, ,, ,, ,, (bone dry) fibre	25·0	,,
Soda consumption (NaOH)	12·2	,,
Bleach consumption (bleaching powder)	3·62	,,
Ash of dry stem	3·70	,,
Length of fibre (mean of 10 observations)	0·65	mm.

" The grass was boiled for 6½ hours at 50 lb. pressure in a stationary boiler. In our opinion, the ordinary type of vomiting boiler, as used for the treatment of esparto, would be suitable for the purpose of treating this grass. The grass goes down readily under the treatment of the caustic soda. It yields a product of fair unbleached colour. We tested the bursting strain of paper made from the unbleached fibre with substance of about 16 lb. Demy, bursting strain 27 lb. to the sq. in., substance of about 21 lb. Demy, bursting strain 33 lb. to the sq. in. The fibres possess good felting qualities ; the paper is harder in the unbleached state than in the bleached. It has every appearance of possessing similar qualities to those of esparto. In spite of the extreme shortness of the fibres, as will be seen above, it possesses considerable strength, combined with qualities which appear to render it suitable for fine printings. Although the fibres are shorter than those recorded for esparto, the paper appears to possess greater strength. The yield is somewhat low and the consumption of soda is somewhat high in comparison with esparto.

" Having regard to the rapidity of growth of this grass in many parts of the British Isles, and the possibility of extending its growth on waste lands from whence it might be got into the mills at a low figure, we think paper-makers should turn their attention to the possibility of its utilisation, particularly having regard to the very promising nature of its paper-making qualities.

" Although the soda consumption is high, the fact must not be lost sight of that 80–90 per cent. of the soda in such a case would be

recovered and used over again. The actual cost of chemicals for boiling is therefore a matter of the cost of recovery plus the cost of making good the soda lost during the process."

Messrs. Clayton Beadle and Stevens remark that the paper-maker wants some assurance upon the subject of adequate supplies before he is disposed to try a material of this sort on an extensive scale, for he knows perfectly well that there are many fibres from which he could make paper provided they can be obtained in sufficient quantity to make the enterprise a financial success. The paper-maker therefore is naturally not disposed to exploit any particular material until he sees a chance of getting large and regular supplies of it at a low cost.

Marram grass occurs on most of the sandy shores of the British coast-line. In some places it is limited to occasional tufts but as a rule it is distributed irregularly over a considerable area. Patches of from a few plants to stretches 20 or 30 yards across are found with moderately wide, bare intervals, the smaller patches being often buried to a considerable depth in loose sand. This would appear to make economical harvesting almost impossible and if steps are to be taken to collect the material in bulk, certain areas should be set apart in Norfolk or Lincolnshire for experimental purposes. By selecting positions where the grass is already plentiful and using the existing stock for close planting of an area of about five acres, it would be possible to harvest a full crop at the end of the second year which could be made the basis for deciding whether the crop is likely to be profitable or not. When growing in a dense mass it is unlikely that the leaves of any except those of the outer plants would become buried in sand, and clean leaves would lessen materially the cost of harvesting. An area of five acres could be planted at a small cost, for the ground would need no preliminary preparation and two men would, in a few days, be able to divide up sufficient plants, and plant the area with clumps three feet apart.

Providing it proved to be a paying crop, Marram grass might be planted on any sandy area along the coast. Suitable sites are to be found in Dorsetshire, Kent, Norfolk, Lincolnshire, Lancashire, South Wales, Scotland and elsewhere.

There is no reason to doubt the ability of the plant to withstand the repeated cutting of the leaves, for although this grass was introduced into New South Wales as recently as 1883 the inhabitants have for many years pastured their cattle upon the young leaves. An account of its introduction into New South Wales by Baron von Mueller, together with a detailed description of its culture and behaviour in that country, is given in *K. B.*, 1897, pp. 211–217. From this article we learn that although originally introduced for the purpose of binding sand, it had by 1893 become acknowledged as an important fodder grass, cattle being turned into Marram grass enclosures during the early rains of April and allowed to remain there until the advent of the dry season.

Marram grass is also grown largely on the west coast of France for the purpose of fixing the sand prior to afforestation and if it were planted in dense masses it would be possible to obtain a large yield from that region alone. Similar possibilities are afforded by

the coast line of Holland, Belgium, Germany and N. Africa. Various references to its use in Germany for fixing sand and checking coast erosion are to be found in "Handbuch des deutschen Dünenbaues," by Paul Gerhardt and others ; pages 344–414 being devoted largely to the cultivation of this and allied species. A series of illustrations indicate the windswept and barren areas of sand where the grass flourishes, and also the methods of planting and general cultivation which are encouraged.

Whilst the preceding notes were in press a communication was received from Mr. O. R. Evans, Town Clerk to the Borough of Port Fairy, Victoria, to the effect that his attention had been directed to the note on "Marram Grass for Paper Making," which appeared in *K.B.*, 1912, p. 396. In asking for further information he added :—"This question is a very important one to this borough. The council has under its control miles of coast line planted with Marram grass, and the facilities are available for the establishment of an industry, should it be practically demonstrated that paper could be profitably manufactured from Marram grass."

Mr. Evans also furnished information regarding the introduction, cultivation, and growth of Marram grass in the neighbourhood of Port Fairy, the following being the salient points :—

The grass was originally introduced into the Colony of Victoria in 1883 by Baron von Mueller, seeds being sent to the Borough Council of Port Fairy to test on the then troublous, barren, shifting sand hummocks facing the shores. Great care was taken in raising the first young plants and the results have been far-reaching, for miles of sand dunes, on both the eastern and southern shores, have been entirely reclaimed in such a complete manner that, where for years nothing but shifting sand prevailed, there is now an area of magnificent grass, growing as thick as a cornfield and to a height of four feet. The grass is said to be practically indestructible, burning, cutting, or eating-off by cattle making it thrive, and in most exposed shifting sands it grows as strongly as in a sheltered corner. The plantations are under the control of Mr. S. T. Avery, and they are formed by dividing the clumps into sections as large as a man can conveniently grasp, and planting them two feet apart in rows six feet apart. Where the sand is not likely to shift, the roots are buried to a depth of nine inches, but where shifting sand is encountered they are buried from three to six inches deeper. In this way 3630 plants are placed on an acre of ground, 2800 plants weighing a ton. The most favourable time for planting is from early May to the end of July, and at the end of a year thinning and transplanting is carried out if plants are required elsewhere. Grass from the Port Fairy district has been supplied to the Governments of the five Australian Colonies, New Zealand, Tasmania, Cape Colony, India, and Brazil for planting in the loose sand of the coast regions, and in each case it is said to be thriving satisfactorily. Grass exported in this manner is dug, packed, and carted to wharf or railway station at a cost of about 50*s*. a ton.

From what can be learnt of the condition of Marram grass in the Port Fairy district, it is reasonable to conclude that the Borough Council would be well advised to enter into negotiations with some

firm of paper manufacturers for the purpose of testing the value of the grass when supplied in considerable bulk. The results of such tests would be watched with considerable interest not only by Australians but by Europeans of many nationalities.

W. D.

Planting in Uganda.*—The book is the outcome of the authors' experience of plantation work in Uganda, and has been written for the guidance of planters who may now be settling in Uganda, and who are bound to suffer from lack of knowledge of the peculiar conditions under which plantations have to be worked in that region.

The physical features of the country are described and photographs are reproduced showing the types of country suitable for plantations. Other photographs show the crops in the various stages of development, and the history of their introduction is given.

Para rubber and cocoa were first experimented on with plants received from Kew in 1901, and it is pleasing to learn that the whole of the cocoa now grown in Uganda has come from these young plants and their progeny.

Chapter iii is devoted to "Yields and Results," and some of these are very striking. For example, coffee produces a "maiden" crop in 2½ years from the time of sowing, and a full crop is obtained at 3 years, which is 2 years in advance of Ceylon, where 5 years are necessary before a full yield is obtained. Two crops are borne annually, and the product is considered in London to be of "high grade," and the prices obtained are said to be entirely satisfactory.

Advice is given as to the selection of suitable land for planting, the establishment of nurseries, laying out of plantations and their management, useful shade- and cover-plants for preventing denudation by the rains, and the methods of clearing and planting in considerable detail, with numerous excellent illustrations of the methods followed.

The most common weeds and their root-systems are described and illustrated, together with advice as to their eradication.

Other chapters are devoted to the erection of factories and machinery, collection and preparation of the crops, the direction of labour, the cost of establishment of plantations and the preparation of products.

There is also a chapter by Mr. G. Massee on diseases caused by fungi.

J. H.

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*Planting in Uganda. By E. Brown, F.L.S., and H. H. Hunter, LLD. London: Longmans, Green & Co.; Dublin: The Talbot Press: 1913: 176 pp., 41 illustrations and 2 maps.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 10.] **[1913.**

LVIII.—SOME NOTES FROM A WEST INDIAN CORAL ISLAND.

T. M. Savage English.

These notes have been made during a three years' residence in Grand Cayman, an island of the British West Indies, 17 miles long, 1 to 6 miles wide, 19° north of the Equator, and in the track of the ocean current from the Eastward which afterwards becomes the Gulf stream.

This island has a comparatively dry climate with irregular rainfall, a temperature ranging between a few degrees above 90° and a few degrees below 60°, and well-marked summer and winter, the means of February and August differing by about 8° ; a climate which seems to suit *Vitis vinifera* and *Ficus carica*. *Sambucus nigra*, perhaps the most adaptable of all flowering plants, becomes evergreen and flowers several times a year but seldom if ever ripens seed. And out of a large number of British wild flowers, which the writer has tried to grow from seed brought from the south of England, only two, *Sinapis tenuifolia* and *Alisma plantago*, have continued to the second generation, when *Sinapis* was finally destroyed by caterpillars of the local "white" butterfly. Some plants of *Alisma* are still alive, putting out leaves, very much smaller than those of their ancestors, every three or four months ; but not one of this generation has flowered.

Grand Cayman is a typical "coral island" nowhere more than 30 or 40 feet above sea level and, being entirely composed of porous rock, practically devoid of fresh water except for a few days or at the most weeks after heavy rain when the mud at the bottom of some of the depressions in the almost universal rock is covered by enough water to maintain a scanty aquatic flora, including *Sagittaria*, *Typha*, *Jussiaea*, *and Ceratophyllum*. *Nymphaea ampla* which occurs in a few places is very possibly of human introduction and in any case is likely to be exterminated before long by cattle. Any hole in the rock deep enough to reach sea level holds brackish or more probably salt water which as a rule rises and falls with the tide ;

(32684—6a.) Wt. 212—780. 1125. 12/13. D & S.

and it is noticeable that not only do many of the Cayman plants, *e.g.*, *Hippomane Mancinella*, *Portulaca oleracea*,* *Swietenia Mahagoni*, *Thrinax argentea*, Mart., grow where their roots are sometimes covered by salt water (the extreme range of ordinary tides is about 2 feet), but that land birds such as *Dendroeca* are common among the mangroves miles from any fresh water except occasional dew or rain on *Rhizophora* or *Laguncularia*. The other "mangrove" *Avicennia*, which exudes brine from its leaves, generally has leaves and twigs "frosted" and glistening with salt crystals and not even a lichen, far less an orchid, seems able to exist on it, though *Schomburgkia Thomsoniana*, the common orchid of Grand Cayman, is frequent on *Laguncularia* and is occasionally to be found on old trees of *Rhizophora*.

A snake, *Ungalia maculata*, seems quite at home in salt water among these trees, as do water beetles and water boatmen. Dragon flies too abound and go through their metamorphoses in the sea. More than this the almost perpetual sea breezes which sweep the island, and give it an ideal climate from the human point of view,† bring with them so much spray from the reefs that wire mosquito netting, galvanized copper, even phosphor-bronze, has a lifetime if anything shorter than that of the "butterfly net" variety; and "staghorns" surmount every tree at all above the general level of the bush.

So it will be seen that Grand Cayman is by no means a suitable place for the establishment of any organism at all intolerant of salt, of course in those parts of the island where the surface is more than a foot or two above the level of high tides, where there is some soil, and where there is a sufficient extent of "bush" to give shelter from the sea breeze, conditions are more favourable, and seeds of non-maritime plants brought by birds or the wind have some chance of growing and getting established.

Passiflora cuprea, *L.* has apparently been brought by a bird within the last few years and is certainly being spread rapidly by this means. It seems to have been unknown to the islanders until lately and it is most unlikely that they would not have had knowledge of and a name for a plant, such as this, with conspicuous flowers and a comparatively eatable fruit.

Seeds brought by the sea no doubt have many more difficulties to surmount than if they come through the air, but want of opportunity is not one of them. The quantity of living seed afloat at this western end of the Caribbean Sea must be immense, for it is hardly possible to examine more than a few feet of the windward beaches of Grand Cayman without finding a seed of some sort; leguminous, probably, if it is not one from a Manicaria palm, though there are plenty of others.

Other jetsam includes electric light bulbs, occasionally in perfect order, but, as it is impossible to say where they have come from, of no particular interest; and bottles, which are sometimes more instructive. Recently two have contained messages; one, most unfortunately undated and only partly legible, was from Ceará in

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* This is able to survive complete submersion by at least four successive tides.

† The death rate of Grand Cayman is one of the lowest in the world—below 8 for the last 3 years.

Brazil ; the other, which gave date, latitude and longitude, had not travelled so far, having been dropped overboard from a local vessel about 60 miles to the E.N.E. six days before it was found on the beach. It was forwarded in time to be "news," though it was merely to say that its writer would not be home so soon as he had expected to be.

Bamboos, of which there are very few living in Grand Cayman, and trees of larger size than any locally grown, and in comparatively fresh and perfect condition, come ashore fairly often, and suggest a means of transport for various forms of life—most probably from Cuba.*

Live cocoanuts are not frequent—perhaps one a year to each mile of beach—but many more are no doubt picked up floating between the reef and the shore by fishermen and others. Manicaria nuts are very abundant. The islanders call them "sea-cocoanuts" (cf. *Lodoicea* from the Seychelles) and sometimes eat them, though they are considered, and probably with good reason, to be indigestible. Occasionally perfect fruits are found, but no "sea-cocoanut" has ever been known to germinate, and there is not a tree of it in the island.

Presumably the reason is to be found in the time taken in transit from Trinidad, or from wherever in South America these nuts may come. In a few cases signs of germination are visible when the nuts are opened, so it may be that this starts before or very soon after the commencement of the sea voyage, and is fatally checked by absorption of salt water. There is one known instance, and apparently one only which will bear investigation, of a plant having established itself unaided from sea-borne seed in Grand Cayman. This is *Cassia lineata*, now fairly common in places on the south side of the island and locally known as "storm weed."

It was first found soon after one of the notable hurricanes ; some say in 1876, others in 1903, but it is agreed that it was unknown before and was noticed at once because it seemed to be a good garden flower.

Some grasses are said to have appeared after hurricanes, but on investigation it would seem that they appeared in quantity rather than for the first time, occupying ground where "bush" had been destroyed ; there is some uncertainty too as to which particular grasses they are.

A small colony of *Ipomoea acetosifolia*, a plant which the writer has only seen in this one place in Grand Cayman, extending along about a hundred yards of shore from the remains of a pile of debris left by the 1903 hurricane, may very possibly be derived from a seed thrown up then ; but the evidence, of course, is only presumptive. As it would also have been concerning a single plant of *Sophora tomentosa*, evidently some years old, flowering and about to ripen seed, which unfortunately disappeared in the heavy sea resulting from the near passage of the hurricane of November, 1912. It was new to the islanders, and they can give a name to almost anything that grows in the bush.

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* The Cayman reptiles seem on the whole to be of Cuban rather than Jamaican origin.

It is only after a hurricane has caused the sea to be exceptionally high that any seed is likely to be left far enough up the beach to have much chance of establishing itself on an island such as this, where no earthquake has ever been recorded; for, though there seems to be sufficient evidence that Grand Cayman is being steadily, and from a geological point of view rapidly, lifted up, this elevation can hardly be rapid enough to have much effect on the establishment of new plants.

Signs of this elevation are to be seen on the South side of the island where there is a flat topped reef of solid coral rock long since dead which is said to have been habitually passed over by canoes within living memory though it is now impassable. Again in the South West where a rock which is said to have been used in the early seventies of the last century as an ordinary launching place for canoes is now two feet or so too high above the ordinary tide level for this to be done with any safety. Further evidence is afforded in various places where patches of *Rhizophora* are gradually dying out and being replaced by more terrestrial forms—often by *Cereus*; in the gradual disappearance of sandy beaches and exposure of the rock beneath and in the continued existence of Grand Cayman itself. For, if a lowlying coral island, such as this, is to be kept above water, steady elevation seems necessary in order to balance the erosion due to tropical sunshine, sea breezes, rain and vegetation, which between them soon give to hard* coral rock exposed to their influence very much the appearance, on a large scale, of a lump of sugar taken out of hot tea. There is also the erosion due to the action of the water in and from mangrove swamps, which in a short time dissolves even such massive shells as those of *Strombus*† and planes down the underlying rock to a more or less flat surface showing excellent sections of its fossil shells; harder lumps being left here and there as rugged "islands"—to disappear more slowly.‡

This elevation can perhaps be satisfactorily accounted for by the inward and ultimately upward thrust of the ever growing wall of coral debris on the seaward face of the reef. Seeing then that it may only be four or five times in a century that seeds are likely to be left sufficiently out of the reach of ordinary high tides to be able to do much more than start their growth before they again find themselves in salt water, and that even so they must in most cases be able to grow in a soil which is to a large extent composed of calcareous sand, it is small wonder that the immense number of seeds thrown ashore alive should produce comparatively few seedlings. And as soon as a seedling begins to show itself it is exposed to attack by land crabs.

Two species are particularly destructive in Grand Cayman, *Cardisoma guanhumi* and *Gecarcinus ruricola* (?). The first, being the

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* Much of this rock is hard enough to make sparks from steel.

† A crab shell only lasts a few weeks.

‡ It is interesting in this connection to compare the account given of the erosion on Little Coco in *Natural History Notes from H.M.I.M. Survey Steamer "Investigator" No.* 25. *The vegetation of the Coco Group. By D. Prain* in the *Journ. Asiatic Soc. Bengal LX*, Pt. II. No. 4, 1891, pp. 288 et seq.—Ed.

edible crab of this part of the world, is known simply as *the* crab. It seems to be found all over the island and grows to a considerable size, an old male being sometimes as much as 6 inches across and having its larger claw no less than 14 inches in length from its junction with the body to the end of its "jaws," while these become so bowed that when they are shut a space as much as 2 inches across and 4 inches in length may be enclosed, little more than the actual points meeting.

The female has claws much smaller than those of the male, more even in size, and apparently more destructive. She seems to be just as terrestrial when she is carrying her minute eggs, which may number two millions or more, as she is at other times, though she is said to go into the sea to wash them off when they are about to hatch.

These crabs are generally clay coloured varying to fairly bright orange or to grey, while some are brilliantly blue.

They are great burrowers, as a rule nocturnal, in any case seldom appearing while the sun is shining or when the weather is dry, and are as omnivorous as anything that lives—cannibals too and wholesale devourers of the smaller species.

In places where they abound nothing is safe from them. They will take into their holes things for which they cannot conceivably find a use—a knife for instance or a pocket compass. They will eat the eggs from under a sitting hen, if not the hen herself, as readily as the leaves of seedling cocoanut trees, and of these from 6 to 10 per cent. have to be replaced if they are planted in newly cleared ground before the crabs have been very thoroughly thinned out. They are responsible for frequent patches of bare soil in the "bush," which get covered with vegetation when the crabs are gone. During the drier months of the early part of the year, they go underground to change their shells and add to their destructiveness by barricading the mouths of their holes with masses of sticks and rubbish like jackdaws' nests, nipping off or rooting up saplings as much as three quarters of an inch in diameter for the purpose. These holes always seem to reach water and make excellent and much used breeding and hiding places for mosquitoes, while if they are at all deep the salt mud which is perpetually being brought up from them ruins what would otherwise be excellent soil for some distance around their entrances. Fresh water seems to be rapidly fatal to this crab. Before it was made proof against them they were continually getting into a cemented rain-water cistern belonging to the writer and, so long as they were alive, were hard to get out from a depth of 5 feet. But in less than an hour they were always dead.

In uncleared "bush" there are perhaps 200 or 300 of them to the acre, and at first they are so fearless of man that while clearing is being done they will come up to feed on leaves and shoots as these fall to the ground; but they learn quickly and become active enough in getting away to make shooting them with an air gun or small rifle decidedly better sport than might be supposed. And, provided that they come from places where they are not likely to have had access to garbage, they make excellent food.

Gecarcinus ruricola (?) is seldom more than 2½ inches across and exhibits various shades of purple, crimson and orange, whence its local name of "redshank." It is by far the most numerous of the Cayman crabs, though not often to be found far from the dry sandy land near the sea and very rarely if ever among mangroves. On the whole it is a scavenger rather than a destroyer, and if it were less numerous, would not be more detrimental to plant life than are three or four other species which seldom leave the mangroves. But its numbers are so great that the damage done by its burrowing is appreciable, as is also its destruction of seedlings.

Fortunately it has many enemies, and of these perhaps the chief is *Mus alexandrinus* which, when living in the "bush," seems to feed principally on crabs, though it is no doubt to avoid being itself the food of large ones that it has become almost as arboreal as a squirrel, usually making its nest in some such place as the crown of a cocoanut palm. It shows that this habit of living in trees is a recently acquired one by making for the ground rather than the higher branches when it is hunted.

Among the plants introduced to Grand Cayman by means of seeds picked up on the beach, or found floating, and subsequently grown in a garden *Morinda citrifolia* seems to be fairly established and, as other fruits were found at Cayman Brac 60 miles to the N.E. at about the same time as the original one at Grand Cayman, it seems likely that Cuba was its country of origin ; unless of course all the fruits came from some passing vessel. Fruits of *Mammea americana* are sometimes found in a more or less eatable condition, so this tree also may ultimately be introduced to the island "by sea." The writer has been using seaweed, mostly sargasso, but with some admixture of *Thalassia*, as manure for cocoanut trees—and with excellent result, some of the trees, after about a year's manuring, having increased the number of young nuts in their bunches from 5 or 6 to more than 30, and in two instances to 48 and 49, while the manured trees have so far escaped the diseases which, particularly "bud rot," play such havoc in this island. From this seaweed a large number of seedlings have sprung up and some, including *Terminalia*, *Sesuvium*, and several species of *Ipomoea*, have gone on growing, but generally, if the crabs let them get so far, and it seems all but impossible to protect them from things which climb like cats and burrow like moles, they go off more or less suddenly—presumably when they have come to an end of their original supply of nutriment.

So far nothing has survived which is undoubtedly new to the island, though a *Cassia* and two or three other plants not yet determinable may possibly prove to be so.

It certainly seems that the appearance from sea-borne seed and survival of a new plant on a crab-infested island like this, which only offers suitable soil and surroundings to such seaside plants as it already has in abundance, must be a rare event—without human aid a very rare one indeed.

PLATE I. KIRSTENBOSCH, VIEW LOOKING WEST.

[To face page 372.

PLATE II. KIRSTENBOSCH, VIEW LOOKING SOUTH.

To face page 373.]

LIX.—VIEWS IN THE NATIONAL BOTANIC GARDEN OF SOUTH AFRICA.

We have recently received some photographs taken at Kirstenbosch by Professor H. H. W. Pearson, two of which are reproduced on the accompanying plates.

The following particulars were sent with the photographs.

In Plate I. is shown a view looking West taken from within the boundaries of the estate. Two of the best known of the Table Mountain gorges are shown—Window gorge to the extreme right; Skeleton gorge slightly to the left of the centre. Both these deliver perennial streams into the gardens. The upper boundary is not yet known; for purposes of protection it will doubtless be placed on the top of the ridge; in a strict sense the western limit lies at least 700 feet up the slope, and includes the lower ends of the gorges which are richly wooded with native trees. The Curator's house is shown on the left. The trees nearest the foreground are camphors, part of an avenue planted 18 years ago by Mr. Rhodes.

Plate II. represents a view looking due South along the "Rhodes Road." All the area visible lies within the gardens. The Table Mountain range lies out of sight on the right. The Director's house will be built on the summit of the ridge a few yards to the right of the present road. The trees forming the Avenue are *Ficus macropylla* (?) in the foreground; camphors beyond the position of the wagon. The former will probably be removed. The hill slope is covered with *Pinus Pinaster* among which are many Silver trees (*Leucadendron argenteum*). The pines are now being taken out, with a view to covering the ridge of the hill with Silver trees.

A nursery has already been formed, and one of the photographs sent by Professor Pearson shows a bed of the succulent plants recently presented to the gardens, which represent the nucleus of a collection that should be unsurpassed by any other institution. The nursery has been placed on a piece of gently sloping ground with the Curator's office close at hand, and the slope is being terraced to form suitable nursery beds. Over 1000 species of plants have been sent in for cultivation since the commencement of gardening operations on July 1st.

The five Trustees of the Garden have now all been appointed. The names of the three Government nominees and of the representative of the Corporation of Cape Town have been given on p. 311, and the fifth Trustee, the representative of the Botanical Society of South Africa, is Mr. W. Duncan, M.L.A., ex-Mayor of Cape Town.

LX.—THE SOUTH AFRICAN SPECIES OF CLUYTIA.

D. Prain.

While preparing an account of the South African *Crotoneae* for the *Flora Capensis* some difficulty has been experienced in reconciling the history of some of the species, as recounted by Linnaeus, Lamarck, Thunberg, Willdenow and Poiret, with the pre-Linnean figures cited by these authorities. These difficulties have not been experienced by the writer alone; they are reflected in the arrangements adopted by botanists so competent as Drège and Meyer,

Ecklon and Zeyher, Krauss and Baillon, whose work has lain in the field or has been in the main confined to the citation of specimens. These difficulties make themselves apparent even in the pages of careful monographers like Sonder, Müller, Knauf and Pax, all of whom have essayed a critical revision of this genus.

Some comprehension of the various difficulties has only been possible as the result of a close examination of a number of different collections; opportunities for making such an examination as was required have been provided through the kindness of many friends of Kew. In examining the Linnean herbarium the writer has had the benefit of the personal assistance of Dr. Daydon Jackson, thanks to whom it became possible to fix the dates and state the provenance of three extremely critical Tulbaghian specimens, the existence of which, because of inexact knowledge as to these points, has been to some extent instrumental in originating the confusion which marks the work of the earlier writers. To the courtesy of Professor Juel we owe an opportunity of examining the types of Thunberg, to that of Professor Urban we are indebted for the privilege of studying the types of Willdenow, and to that of Professor Lindman for the use of the types of Sonder. In addition the writer has to thank Geheimrat Engler for the loan of specimens from Berlin, Professor Schinz for the use of the material at Zürich, Dr. Lenz for the use of the specimens at Lübeck, and Professors Balfour and Dixon for the use of those at Edinburgh and Dublin respectively. He has also had the privilege of the use of most of the important public and private South African collections—the South African Government Herbarium, the Natal Government Herbarium, the Transvaal Government Herbarium, the Bolus and Albany Museum Herbaria, and those of Dr. Marloth, Mr. Galpin, and the Rev. F. A. Rogers.

It is not necessary to give here an exhaustive account of the contents of every one of these various collections, owing to the fact that the specimens they contain are being cited in detail in a forthcoming volume of the *Flora Capensis*, while the cases of misapplication of names which occasionally mark modern monographs will be dealt with critically under individual species in the subjoined synopsis of the genus. In the case of three collections, however, a more detailed review of their specimens is required, in order that the position created by their owners may be appreciated. These collections are those which belonged to Linnaeus, to Thunberg, and to Willdenow respectively, upon an appreciation or misappreciation of which has depended all the advances and most of the confusion of the period from 1753, when Linnaeus published the first edition of the *Species Plantarum*, to 1810, when Poiret published the second volume of the *Supplement* to the *Encyclopaedia*.

Linnaeus. The bi-nominal contributions of Linnaeus to the elucidation of the genus *Cluytia*—spelt by him *Clutia*, began with the first edition of the *Species Plantarum* in 1753, wherein (p. 1042) he enumerated five species. Three of these do not come from South Africa and do not belong to the genus; they therefore do not concern us. The remaining two are *C. Alaternoides* and *C. pulchella*. To these Linnaeus added, in the second edition of the *Species Plantarum* in 1763, a third species *C. polygonoides* (p. 1475), and in

the second *Mantissa* in 1771 a fourth species *C. tomentosa*. So far as the three species of 1753 and 1763 are concerned we know, from the fact that the *Species Plantarum* was in the main a bibliographical compilation, that any specimens in the Linnean herbarium bearing the corresponding names must be taken rather as representative examples than as types in the modern sense of that term. It is only in the case of the fourth species that the Linnean herbarium contains the actual specimen upon which the specific description was based. Even in this case, as we shall see, Linnaeus in effect ultimately treated that specimen as a representative and not as a typical one. Dealing with these species in detail we find that :—

(1.) **Alaternoides,** Sp. Pl. 1042 (sphalm. *alaternoides*) includes, according to the cited figures, three very distinct S. African plants,

(*a*) Burmann's *Chamaelea foliis oblongis nervosis floribus ex foliorum alis* of 1738 (Rar. Afr. 116, t. 43, fig. 1) ;

(*b*) Burmann's *Chamaelea foliis latis oblongis floribus ex alis in spicam erectis*, also of 1738 (l.c. 118, t. 43, fig. 3) ; and

(*c*) Commelin's *Alaternoides africana telephii legitimi imperati folio* of 1701 (Hort. Amst. ii. 3, t. 2) :

(2.) **pulchella,** Sp. Pl. 1042, was based upon the plant figured by Commelin in 1697 as *Frutex aethiopicus portulaceue folio, flore ex albo virescente* (l.c. i. 177, t. 91) :

(3.) **polygonoides,** Sp. Pl. ed. 2, 1475, was created in order to accommodate the second of the three distinct species to which the name *Alaternoides* had been applied ; though, by an oversight, Linnaeus, while making Burmann's second figure the basis of his new species, also left the synonym where it had been placed by him in 1753 : while

(4.) **tomentosa,** Mant. ii. 299, was based on a specimen collected by Governor Tulbagh (*Tulbagh* 129) and despatched by him to Linnaeus on April 25, 1763—too late therefore to find a place in the second edition of the *Species Plantarum*.

When we turn to the material of the genus *Cluytia* in the Linnean herbarium which illustrates the foregoing arrangement, we find that there are fifteen sheets in the '*Clutia*' cover. Three of these represent species of Linnaeus' *Clutia* which do not belong to the genus as now understood, and so do not here further concern us. Of the remaining twelve sheets one bears two distinct plants so that in all there are thirteen specimens. In two instances two sheets have been pinned together by Linnaeus himself, only one sheet of the pair having been written up by him. Taking the species in the order in which they were treated by Linnaeus in his published works we find that these thirteen specimens on their twelve sheets arrange themselves as follows :—

(1.) **Alaternoides** : a sheet written up by Linnaeus as "1. alaternoides," which, as we know from Jackson (Ind. Linn. Herb. 59), was already in his possession in 1753. Whence Linnaeus obtained this specimen is not indicated ; the plant itself is one described and figured by Burmann in 1738 (Rar. Afr. 116, t. 43, fig. 1). This is the only specimen of *C. Alaternoides* possessed by Linnaeus in 1753. There are, however, two other sheets in the Linnean

collection now which bear the name "alaternoides." One of these is a sheet on which are fixed two very different specimens ; these specimens bear the numbers 115 and 127 ; they were collected by Governor Tulbagh and sent by him to Linnaeus on 25 April, 1763. The sheet in question has been written up by Linnaeus himself, and an examination of Tulbagh's invoice list shows that upon it also Linnaeus has, against these two numbers, placed the endorsement *Clutia alaternoides*. The two plants not only differ from each other ; both of them differ from the first of the three different plants referred by Linnaeus, on purely bibliographical grounds, to *C. Alaternoides* ; neither of them belong to the second or to the third of the three plants whose portraits have been cited by Linnaeus under *C. Alaternoides*. The third and last sheet in the Linnean herbarium which has been written up as *C. Alaternoides* is one which reached Linnaeus from Thunberg. The specimen it bears is the plant figured by Commelin as *Alaternoides africana, etc.*, but the name "alaternoides" on this sheet was written up, not by Linnaeus, but by his son.

(2.) **pulchella** : a sheet written up by Linnaeus as "2. alaternoides," which we again know from Jackson (l.c.) to have been already in Linnaeus' collection in 1753. As regards this plant there is not the element of doubt which attaches to *C. Alaternoides*, so far as concerns the conception which Linnaeus may possibly have formed of the limitation of the species ; the specimen which he has himself written up belongs to the species figured by Commelin as *Frutex aethiopicus portulaceae folio, etc.* But if he has not in this instance created confusion as to identity, Linnaeus has shown that he entertained a somewhat indefinite conception as to the distribution of the species. This is one of the two instances where Linnaeus has pinned two sheets together ; the undermost sheet, on which the specific name has not been written, bears in Linnaeus' hand-writing the word "India."

(3.) **polygonoides**: two sheets pinned together by Linnaeus. The two specimens are conspecific, though only the uppermost has been written up by Linnaeus ; on one of the sheets is an indication that the specimen was collected by Sparrmann. The two specimens belong to a plant described and figured by Burmann in 1738 (Rar. Afr. 118, t. 43, fig. 3). There is no indication as to the date at which Linnaeus acquired either specimen, but it seems clear that at least one of them had reached him before 1763 ; it is difficult otherwise to account for the transfer of this plant from *C. Alaternoides*, in which it had been placed in 1753, and for its treatment as a distinct species. This transfer, however, and this recognition of what is clearly a valid species, was marred by more than the oversight which the citation of Burmann's name under two species involves. We find from his herbarium that though Linnaeus, as soon as he had an actual specimen before him, realised that Burmann had not committed the error of figuring one species under two different names, he had nevertheless formed the same imperfect conception of the limitation of Burmann's second species that he had of Burmann's first one. This plant, represented by the two specimens whose sheets are pinned together, has polished leaves with revolute margins borne on perfectly glabrous twigs. But, on

another sheet in his herbarium which bears a specimen with similarly polished leaves, Linnaeus has again written the name "polygonoides," though in this instance the leaves of the plant have involute margins and are attached to twigs which are puberulous.

(4.) **tomentosa**: a sheet bearing the specimen marked 129, already referred to as having been collected by Governor Tulbagh. Here, it might have been conceived, the creation of misapprehension was hardly possible. Yet, even in this case, the confusion imported into the conception of *C. polygonoides* was repeated. Thunberg, we find, gave specimens of two species of *Clutia* to Linnaeus; one of these, which Linnaeus did not attempt to determine, was referred to *C. Alaternoides* by the younger Linnaeus; the other, with which Linnaeus did deal, he wrote up as "Clutia tomentosa, Mant., femina, CBS." This endorsement indicates the belief of Linnaeus that what Thunberg had given him was the female of his own *C. tomentosa*, originally described in the second *Mantissa* from Tulbagh's male specimen. The capsules of Thunberg's plant are quite glabrous; those of *C. tomentosa*, Linn., are densely pubescent, so that the identification was inexact.

We have now accounted for eleven of the thirteen specimens in the "Clutia" cover of the Linnean herbarium and seen that eight of these have been actually named by Linnaeus, while two more have received at his hands the 'identification by implication' which the pinning together of two sheets necessarily suggests; the eleventh, as we have explained, was written up by the younger Linnaeus—not without justification, seeing that the plant actually belongs to one of the three species included by Linnaeus under *Alaternoides*, the name which the younger Linnaeus wrote upon the sheet. The two remaining specimens have been given no specific name either by Linnaeus or by his son. On one of them, which was collected by Sparrmann and which is conspecific with the Thunbergian specimen to which the younger Linnaeus gave the name *C. Alaternoides*, Linnaeus himself has written "Clutia" only. On the other, as to the history of which we find no clue in the Linnean herbarium, nothing has been written either by Linnaeus or by his son. The interest of this latter specimen is (*a*) that it represents a species quite distinct from any of the species rightly or wrongly identified by Linnaeus: and (*b*) that it is conspecific with a specimen, obtained from Sonnerat, which was treated by Lamarck in 1786 (Encyc. Meth. ii. 54) as the basis of his species *C. daphnoides*.

Before leaving these specimens of the four South African species of Linnaeus, it may be of use to indicate the most appropriate incidence of the various Linnean names. In doing this it is more convenient to consider them in reversed chronological sequence. As has already been indicated, the last species to be published, *C. tomentosa*, Linn. (Mant. ii. 299), is the only one as to which it is definitely known (*a*) that the description was based upon a particular specimen, and (*b*) that this specimen is still available for study. The specimen is "Tulbagh 129 in Hb. Linn.," which belongs to *C. tomentosa* as understood by Lamarck in 1786, and not to *C. tomentosa* as understood, in the light of Linnaeus' later and erroneous identification,

by Thunberg in 1794. We have in reality hardly more difficulty when deciding as to the name *C. polygonoides*, Linn. (Sp. Pl. ed. 2, 1475), for of the two plants included by Linnaeus in the species, it is the one with revolute leaf-margins which alone agrees with the figure by Burmann that Linnaeus cites. As regards *C. pulchella*, Linn. (Sp. Pl. 1042), no difficulty as regards identification arises, and the provenance "India" erroneously attributed to one of the two specimens, is doubtless the result of the receipt, from some correspondent, of specimens collected partly in South Eastern Asia, partly in South Africa, where the recollection of the donor as to the locality of some of his specimens had become obscured. The only serious difficulty is that connected with *C. Alaternoides*, Linn. (Sp. Pl. 1042). Here, as we have seen, Linnaeus at the outset included three very different plants, though at the time of his first publication of the species he only had a specimen of that which we have indicated as *C. Alaternoides*, a (Burm. Rar. Afr. 116, t. 43, fig. 1).

As regards the one which we have indicated as *C. Alaternoides*, b (Burm. l.c. 118, t. 43, fig. 3), we have seen that, as soon as he had at his disposal an actual specimen, Linneaus removed the plant from *C. alaternoides* and made it the basis of a new species. As regards the plant which we have indicated as *C. Alaternoides*, c (Comm. Hort. Amst. ii. 3, t. 2), we cannot, it is true, say that on obtaining actual specimens, Linnaeus removed the plant from *C. Alaternoides*; we can, however, say that though he did obtain two specimens of Commelin's species—one from Sparrmann and one from Thunberg—it did not occur to him to add the plant, when he actually had it before him, to his *C. Alaternoides*. His son, it is true, did recognise the identity of Thunberg's specimen with the plant figured by Commelin, and in spite of the striking difference between Thunberg's plant and the one to which his father's original specimen of *C. Alaternoides* belongs, named it also *C. alaternoides*. In this the younger Linnaeus has been followed, so far at least as citation is concerned, by most subsequent authors; but as to actual specimens we find that careful workers either, like Baillon (Étud. gén. Euphorb. Atl. 30 and Adansonia, iii. 152), recognise the validity of its claim to specific rank; or, like Sonder (Linnaea, xxiii. 127) and Müller (DC. Prodr. xv. 2, 1047) and Pax (Engl. Pflanzenr.-Euphorb. Cluyt. 68), treat it as a distinct and outstanding variety of *C. Alaternoides*. So far then as the three plants originally included in the species by Linnaeus himself are concerned, we are under the necessity of limiting his name *C. Alaternoides* to that which comes first in order of citation, and is, at the same time, the only one whereof, at the time of publication of the species, Linnaeus possessed a specimen.* So far as the two plants (Tulbagh n. 115 and n. 127) which Linnaeus subsequently confused with each other and with *C. Alaternoides*, are concerned, their exclusion from *C. Alaternoides* is essential, and calls for no further discussion, in spite of the fact that it is upon one of these two, which Linnaeus had not seen when he first published the species, that Müller has based his variety "genuina." The only

* This specimen is, moreover, conspecific with the Cliffortian plant referred by Linnaeus to *C. Alaternoides*.

difficulty associated with the action which the facts of the case impose upon us is that we are compelled to exclude from *C. Alaternoides* the particular species from which Linnaeus borrowed an old generic name in order to employ it as a specific epithet. In connection with this, it is to be remarked that, owing to an uncorrected typographical error on the part of Linnaeus, the real significance of the specific term has been overlooked in most of the works dealing with the genus except Persoon's *Synopsis* and the *Hortus Kewensis*.

In the first edition of the *Hortus Kewensis* (1789), the name *C. Alaternoides* was used (vol. iii, 419) for a plant which had been in cultivation in England for nearly a century—almost certainly that figured by Burmann (Rar. Afr. 116, p. 43, fig. 1). Here, for the first time, Dryander, on Banks' behalf and in Aiton's name, proposed the orthography *Cluytia*, now adopted in place of *Clutia*.

THUNBERG in 1794 enumerated the South African species of *Cluytia* known to him (Prodr. Pl. Cap. 53); these species were more fully described in 1823 in Thunberg's *Flora Capensis* as edited by Schultes. An impression prevails that the names used in the *Prodromus* do not always have the same incidence in the *Flora*. An examination of the actual specimens in the herbarium of Thunberg shows that this suspicion, so far as the genus *Cluytia* is concerned, is only justified in the case of *C. tomentosa*, Thunb., not of Linn.; even then, it is justified only in a very qualified manner.

In addition to the four species recognised by Linnaeus, Thunberg in his *Prodromus* recognised five others. Two of these, *C. acuminata* and *C. hirta*, do not belong to the genus; the other three, *C. ericoides*, *C. pubescens* and *C. heterophylla*, do. Besides these there is in Thunberg's herbarium another specimen, which is not accounted for in his writings. This he has named tentatively *C. retusa*; it is, however, quite different from *C. retusa*, Linn., because it really is a *Cluytia*, which the true *C. retusa* of Linnaeus is not. The species known to or recognised by Thunberg are:—

(1.) **C. Alaternoides**, represented by five specimens, whereof three belong to *C. africana*, Poir., which as regards bibliographical reference, Linnaeus included in *C. Alaternoides* and Lamarck in *C. daphnoides*, but which as regards specimens neither author dealt with; of the remaining specimens, one is the same as Tulbagh, 127, and is therefore *C. rubricaulis* var. *grandifolia*, while the other is *C. Alaternoides* var. *brevifolia*, a form unknown to Linnaeus. It is therefore to be noted that although *C. Alaternoides*, Thunb., is intended to be Commelin's plant, it really includes three distinct forms, none of which can be identified with *C. Alaternoides*, Linn.

(2.) **C. pulchella**, represented by two sheets, a male and a female, both of which are *C. pulchella*, Linn.

(3.) **C. polygonoides**, represented in herb. Thunb. by two specimens, a male and a female, both of which belong to the species figured by Burmann (Rar. Afr. 116, t. 42, fig. 3) and therefore to *C. polygonoides*, Linn.

(4.) **C. tomentosa**, represented by two sheets, a male and a female, neither of which is *C. tomentosa*, Linn. The responsibility for this identification does not, however, rest with Thunberg but with Linnaeus, for the female specimen is a manifest duplicate of the sheet in the Linnean herbarium which Linneaus erroneously wrote

up as *C. tomentosa*, Mant. *femina*; for this reason it is desirable to treat the female specimen as the basis of *C. tomentosa*, Thunb. (Prodr. Fl. Cap. 53). The male specimen of *C. tomentosa*, Thunb., not of Linn., is certainly identical with what was described by Lamarck as *C. daphnoides*, the female is, on the other hand, much more like the distinct plant collected by Drège, which was issued by E. Meyer in 1843, also as *C. tomentosa*, but which Sonder in 1850 treated as a distinct species. Sonder indeed believed the female of *C. tomentosa*, Thunb., to be identical with *C. tomentosa*, E. Mey., and, in consequence, named the species *C. Thunbergii*. Müller, while agreeing with Sonder that *C. Thunbergii* is distinct, at least as a variety, excluded therefrom Thunberg's female plant and treated it as identical with the male part of *C. tomentosa*, Thunb. non Linn.; the description of *C. tomentosa*, Thunb., in Schultes' edition of the *Flora Capensis* shows that in 1823 both plants were included in the species by Schultes. As to this conclusion Müller, whom Pax has followed, is hardly justified: perhaps the same thing may be said of the treatment by Sonder, whom the writer has followed in this paper. A better view than either might be to consider *C. tomentosa*, Thunb., female, as intermediate between *C. daphnoides*, Lamk., and *C. Thunbergii*, Sond. ex Pax.

(5.) **C. ericoides**, Thunb., is a good species which Linnaeus was unable to distinguish from *C. polygonoides*; it is represented in Thunberg's herbarium by a single male specimen.

(6.) **C. pubescens**, Thunb., is another good species, and

(7.) **C. heterophylla**, Thunb., is yet another good species, neither of which was known to Linnaeus.

In addition to the specimens representing these seven species there is the specimen, already alluded to, not taken up in the *Prodromus* or in the *Flora*, which Thunberg has written up as *Clutia retusa*? It is not *C. retusa*, Linn., because it really is a *Cluytia*; it belongs to the distinct species published by Sonder in 1850 as *C. affinis*.

Jacquin in 1797 (Hort. Schönbrunn. ii., 67, t. 250) described and figured from a plant grown at Vienna a very distinct species, *C. polifolia*, which was not known either to Linnaeus or to Thunberg.

Willdenow, some time between 1797 and 1805, published figures of *C. Alaternoides*, *C. polygonoides* and *C. daphnoides* (Hort. Berol. tt. 50, 51, 52). The date assigned by Pax to this work is 1816, which is only the date of its title page and its completion; Willdenow himself cited these plates in 1805 (Sp. Pl. iv. pars. 2). Of these three figures the first may be accepted as representing a form of *C. Alaternoides*, Linn. But the second is not, nor is it even nearly allied to, *C. polygonoides* as understood by Linnaeus, Burmann and Thunberg. The last is *C. daphnoides* as described by Lamarck; it is one of *Multiglandulosae*, and therefore cannot be the plant figured by Commelin which both Lamarck and Willdenow have included in their *C. daphnoides*.

The identity of the various species enumerated by Willdenow in 1805 (Sp. Pl. iv. pars. 2) is best arrived at by enumerating the specimens in his herbarium under the various species.

(1.) **C. alaternoides**, Hb. Willd. 18592, includes four specimens the first of which is not *C. alaternoides* at all, but is *C. pterogona*, Müll. Arg.; the second is really *C. alaternoides*, Linn.; the third is a form of *C. rubricaulis* Eckl.; the last is, at least in part, *C. africana*, Poir.

(2.) **C. pulchella**, Hb. Willd. 18601, includes two specimens both of which belong to *C. pulchella*, Linn.

(3.) **C. polygonoides**, Hb. Willd. 18593, includes two specimens which Müller has treated (DC. Prodr. xv. 2, 1048) as being somewhat different but which are in fact identical. The species they represent is not *C. polygonoides*, Linn., but a distinct plant, *C. rubricaulis* var. *grandifolia*.

(4.) **C. tomentosa**, Hb. Willd. 18600, is represented by a solitary specimen which belongs to the original *C. tomentosa*, Linn., described, from male material only, in the second *Mantissa*.

(5.) **C. ericoides**, Hb. Willd. 18597, is represented by a single specimen which is really *C. ericoides*, Thunb.

(6.) **C. pubescens**, Hb. Willd. 18599, has nothing to do with the true *C. pubescens*, Thunb., but is the female portion of *C. tomentosa*, Thunb. non Linn.

(7.) **C. daphnoides**, Hb. Willd. 18594, is the plant described by Lamarck under this name.

(8.) **C. heterophylla**, taken up by Willdenow from Thunberg is not represented in Hb. Willd.

(9.) **C. polifolia**, taken up by Willdenow from Jacquin is not represented in Hb. Willd.

(10.) **C. tenuifolia**, Hb. Willd. 18598, is a plant first described by Willdenow as a new species which, however, it is not possible to separate from *C. ericoides* as more than a variety.

Besides these there is a species, *C. patula*, Hb. Willd. 18602, accounted for in the *Sp. Pl.*, which is represented by three specimens but which we must exclude because one of the specimens is not Euphorbiaceous and the other two are examples of *Blachia umbellata*. In the Willdenow herbarium there are in addition two species which for some reason Willdenow did not venture to include in the *Species Plantarum*. It is almost regrettable that he did not because, though they are probably only varieties of one species they are very distinct varieties, while the species to which they belong is a very distinct species. One of the two, Hb. Willd. 18596, is represented by one specimen which Willdenow had defined as *C. thymifolia, foliis lineari-lanceolatis pendulis solitariis elongatis*; the other, Hb. Willd. 18595, also represented by one specimen, he had defined as *C. gnidioides, foliis oblongo-obovatis acutis pedunculis axillaribus unifloris*. The first was subsequently characterised as *C. tenuifolia* by Sonder, under the mistaken belief that he was dealing with *C. tenuifolia*, Willd.; it really is *C. rubricaulis* var. *tenuifolia*. The second is *C. rubricaulis* var. *microphylla*.

Poiret in 1810 (Encyc. Meth. Suppl. ii. 302) advanced our knowledge of *Cluytia* by recognising as *C. africana* the plant which both Lamarck and Willdenow had confused with *C. daphnoides*, though he in turn introduced another confusion by arriving at the unwarranted conclusion that *C. daphnoides* as figured by Willdenow is different from *C. daphnoides* as described by Lamarck.

The second edition of the *Hortus Kewensis* (1813) is a *résumé* of previous work which overlooks the emendation of Poiret, accepts the erroneous conception of *C. polygonoides* first introduced by Willdenow, and adds to our knowledge of the genus only some acquaintance with those species introduced to English gardens.

After the appearance of the account in the *Hortus Kewensis* (ed. 2, v. 422) there was little reference for a generation to these South African species of *Cluytia*. In 1843 E. Meyer (Zwei Pfl. Documente, 174) issued a list of determinations of specimens collected by Drège; in 1845 Krauss (Flora, xxviii. 81, 82) issued identifications of specimens collected by himself; in 1850 Sonder (Linnaea, xxiii. 121 *et seq.*) gave a *résumé* of the South African species; in 1862 Baillon (Adansonia, iii. 151 *et seq.*) issued a revised list of Sonder's determinations; in 1866 Müller (DC. Prodr. xv. 2, 1043) monographed the genus. It is not here necessary to pass under review all the specimens dealt with by these writers or to discuss their efforts to disentangle the confusion created more particularly by Linnaeus. Their results and those of Professor Pax, the most recent monographer of the genus whose work has been of the greatest assistance in dealing with the South African species, may be readily followed with the assistance of the synonymy cited in the subjoined systematic synopsis.

Included in this synopsis are descriptions of those species for which a description is still required; preceding it is printed a key to the whole of these South African forms.

Cluytia, Linn. emend. Dryand.

Clutia *Linn. Sp. Pl.* ed. 1, 1042 (1753). Altora, *Adans. Fam.* ii. 356 (1763). Cluytia, *Dryand. in Ait. Hort. Kew.* iii. 419 (1789). Cratochwilia, *Neck. Elem.* ii. 339 (1790). Clytia, *Stokes, Bot. Mat. Med.* iv. 543 (1812).

*Petala maris singula 1–2-glandulosa; glandulae saepissime petalorum ungui adnatae raro a petalo liberae et in fundo calycis sitae.

†Folia sessilia vel subsessilia, opaca vel rarissime (*pterogona*, *impedita*) pellucido-punctata.

‡Folia margine involuta, glabra, ericoidea; ovarium glabrum.

Ramuli puberuli; folia 3-4-plo longiora quam lata
1. *C. ericoides.*

Ramuli glabri; folia minopere longiora quam lata
2. *C. nana.*

‡‡Folia margine nunc plana nunc revoluta; nunquam ericoidea.

§Folia pubescentia; ovarium tomentosum.

Petala feminei modo maris basi glandulosa.

Folia parvula, quam lata vix longiora 3. *C. tomentosa.*

Folia mediocria, quam lata duplo longiora
4. *C. marginata.*

Petala feminei eglandulosa.

Folia margine plana ... ... 5. *C. sericea.*

Folia margine plus minusve revoluta.

Folia 2·5–7·5 cm. longa, minopere revoluta
6. *C. Katharinae.*

Folia 1·2–2·5 cm. longa, saepius valde revoluta
7. *C. pubescens.*

§Folia glabra ; ovarium glabrum.
Caules ramulique alati ; alae membranaceae, eroso-denticulatae ; folia pellucido-punctata
8. *C. pterogona.*
Caules ramulique cylindrici vel angulati angulis coriaceis integerrimis.
Folia opaca.
Folia margine laevia vel minutissime scabrida.
Folia margine valde revoluta.
Folia 8–15 mm. longa ... 9. *C. polifolia.*
Folia 4–6 mm. longa ... 10. *C. brevifolia.*
Folia margine plana vel subplana..
Caules simplices vel subsimplices e basi lignoso plures ... ... 11. *C. virgata.*
Caules copiose ramosi ... 12. *C. laxa.*
Folia margine distincte subdenticulatim scabrida.
Folia margine plus minusve revoluta.
Folia majuscula, 1·5–4 cm. longa.
Folia obovato-oblonga, 12–16 mm. lata
13. *C. africana.*
Folia lanceolata vel obovato-lanceolata, 4–5 mm. lata ... 14. *C. Alaternoides.*
Folia perparva, obovato-oblonga, 5 mm. longa, 2 mm. lata ... 15. *C. imbricata.*
Folia margine plana.
Internodia quam folia imbricata breviora
16. *C. rubricaulis.*
Internodia foliis discretis subaequilonga
17. *C. ovalis.*
Folia pellucido-punctata, margine plana
18. *C. impedita.*

††Folia distincte petiolata ; ovarium glabrum.
Folia margine plus minusve revoluta ; caules prostrati
19. *C. alpina.*
Folia margine plana ; caules erecti.
Folia pellucido-punctata.
Capsula glabra ; ramuli foliique glabri
20. *C. glabrescens.*
Capsula verrucoso-punctata.
Ramuli foliique primum pubescentes, demum glabri.
Petioli 6 mm. longi vel breviores ; ramuli foliique laeves ... ... 21. *C. Galpini.*
Petioli 8 mm. longi vel longiores ; ramuli foliique nunc verrucosi nunc laeves 22. *C. pulchella.*
Ramuli foliique subtus persistenter velutini
23. *C. mollis.*
Folia haud pellucido-punctata, plus minusve pubescentia
24. *C. affinis.*

**Petala maris singula 3–10-glandulosa ; glandulae rarissime petalorum ungui adnatae, fere semper e fundo calycis ortae.
†Folia pellucido-punctata.
Folia margine plana ; caules manifeste ramosi ; ovarium glabrum ... ... 25. *C. natalensis.*

Folia margine parum revoluta.
Caules manifeste ramosi.
Ovarium glabrum.
Folia apice obtusa ... ... 26. *C. platyphylla.*
Folia apice acuta vel breviter acuminata
27. *C. Dregeana.*
Ovarium pubescens ... ... 28. *C. hirsuta.*
Caules simplices vel parcissime ramosi e basi lignoso plures.
Pedicelli fructigeri quàm capsula 3–4-plo longiores; foliorum nervi subtus haud elevati; ovarium saepius plus minusve hirsutum ... 29. *C. disceptata.*
Pedicelli fructigeri quam capsula vix vel haud longiores; ovarium semper glabrum.
Foliorum nervi subtus haud elevati.
Folia basi cuneata vel rotundata 30. *C. monticola.*
Folia basi omnia subcordata ... 31. *C. cordata.*
Foliorum nervi subtus manifeste reticulatim elevati; folia superiora basi cuneata, inferiora basi subcordata ... . 32. *C. heterophylla.*

†† Folia haud pellucido-punctata; ovarium glabrum.
Folia hebetia, margine plana.
Folia distincte petiolata, 4–5-plo longiora quam lata; ramuli subargute angulati ... 33. *C. daphnoides.*
Folia sessilia vel subsessilia, vix 2-plo longiora quam lata: ramuli cylindracei.
Caules prostrati; ramuli pubescentes; folia pilis perpaucis secus costam supra ornata, ceterum glabra ... ... 34. *C. vaccinioides.*
Caules erecti.
Ramuli foliisque pubescentes ... 35. *C. Thunbergii.*
Ramuli foliisque glaberrimi ... 36. *C. crassifolia.*
Folia nitentia, margine revoluta; planta omnino glabra
37. *C. polygonoides.*

§ I. Pauciglandulosae, *Pax et K. Hoffm. in Engl. Pflanzenr.—Euphorb. Gluyt.* 53 (1911), *ampl.*—Petala maris singula 1–2-glandulosa; glandulae saepissime petalorum ungui adnatae raro a petalo liberae et in fundo calycis sitae.

¶ 1. Involutae, *Pax et K. Hoffm.* l.c. 81 (1911).—Folia ericoidea, coriacea, glabra, nitentia, subtus convexa, supra concava, margine involuta.—Species 2; *C. ericoides*, *C. nana.*

1. **Cluytia ericoides**, *Thunb. Prodr. Pl. Cap.* 53 [Clutia] (1794); *Willd. Sp. Pl.* iv. 2, 880 (1805); *Pers. Synops.* ii. 636 (1807); *Poir. Encyc. Meth. Suppl.* ii. 303 (1810); *Thunb. Fl. Cap. ed. Schult.* 270 (1823); *Spreng. Syst.* iii. 48 (1826); *E. Mey. in Drège, Zwei Pfl. Documente*, 174, *partim* (1843); *Sond. in Linnaea*, xxiii. 121, *partim* (1850); *Dietr. Synops.* v. 455 (1852); *Baill. Adansonia*, iii. 151, *partim* (1862); *Müll. Arg. in DC. Prodr.* xv. 2, 1055, *partim et cit. Bot. Reg. excl.* (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 81, *partim et quoad* fig. 19 H. J. *tantum sed. excl. cit. Bot. Reg.* (1911). C. ericoides, *var.* minor, *Krauss in Flora*, xxviii. 82 (1845).

Coast Region: Piquetberg, Malmesbury, Worcester, Cape, Stellenbosch, Caledon, Riversdale, George, Knysna, Uitenhage, Port Elizabeth, and Albany Divs.

Central Region: Prince Albert Div. (fide Sonder).

Var. β, **pachyphylla**, *Prain*; suffrutex, 3–6 dm. altus; ramuli robusti, simplices vel iterum parce stricte ramosi, puberuli; folia auguste ovato-lanceolata, acuta vel acuminata, basi late cuneata, 1·2–1·8 cm. longa, 3–4 mm. lata, subtus plus minusve convexa, supra saepissime concava sed nonnunquam (*C. ambigua*) ibi margine manifeste involuto excepto plana. C. ericoides, *E. Mey.* l.c., *partim* (1843); *Sond.* l.c., *partim* (1850); *Baill.* l.c., *partim* (1862); *Müll. Arg.* l.c., *partim* (1866); *Pax* l.c., *partim et quoad* fig. 26 A–E *tantum* (1911); *vix Thunb.* C. ambigua, *Pax et K. Hoffm.* l.c. (1911). C. pachyphylla, *Spreng. MSS. in sched. Zeyh.*

Coast Region: Cape, Stellenbosch, and Uitenhage Divs.

var. γ, **tenuis**, *Sond.* l.c. 122 (1850); suffrutex, 3–6 dm. altus; ramuli gracillimi, saepissime iterum copiose sed fastigiatim ramosi, puberuli; folia linearia, 1·2–1·8 cm. longa, 1–1·5 mm. lata, subtus semper convexa, supra saepissime concava sed raro ibi margine manifeste involuto excepto plana. *Baill.* l.c. 151 (1862). C. tenuifolia, *Willd.* l.c. (1805); *Pers.* l.c. (1807); *Poir.* l.c. 302 (1810); *Spreng.* l.c. 49 (1826); *Dietr.* l.c. (1852); *Baill.* l.c. 152 (1862); *Müll. Arg.* l.c. (1866); *Pax* l.c. (1911). C. ericoides, *Ait. Hort. Kew.* ed. 2, v. 423 (1813); *Edw. Bot. Reg.* t. 779, *excl. syn. Thunb. et syn. Willd.* (1824); *Sond.* l.c., *partim et quoad loc.* Knoblauch *tantum* (1850); *Müll Arg.* l.c., *quoad cit. Bot. Reg.* (1866); *nec Thunb.* C. gracilis, *Baill.* l.c. 151 (1862).

Coast Region: Caledon, Swellendam and Riversdale Divs.

The central variety, β *pachyphylla*, of the three varieties of this species, is that from which diverge in opposite directions and in almost equal degree the original *C. ericoides* as defined by Thunberg, and *C. tenuifolia* as described by Willdenow. When a comparison is instituted between these two extreme varieties the action of Müller and Pax in maintaining Willdenow's species is readily appreciated. But when full allowance is made for the range of variation that is met with in this group of forms the action of Sonder impresses the student as being more natural than that of Willdenow and Müller. In adopting a name for what is the fundamental, though not in this case the typical, variety it has been unfortunately necessary to avoid using the epithet *ambigua* employed in a specific sense by Pax and K. Hoffmann, owing to these authors having restricted their name to that particular condition of β *pachyphylla* in which the leaves are very nearly flat, at least on the upper surface. For some reason which is not clear, both Müller and Pax refer to the typical variety the plant figured as *C. ericoides* by Edwards in the *Botanical Register*. An examination of the old cultivated specimens in the Kew herbarium and a glance at Edwards' plate show that the figure really represents the plant described by Willdenow as *C. tenuifolia*, not that described by Thunberg as *C. ericoides*. This, too, is the plant enumerated in Aiton's *Hortus Kewensis* as *C. ericoides*, which had been introduced to English horticulture by F. Masson in

1790. There is not the slightest evidence that either Thunberg's or Sprengel's plant ever came into cultivation in Europe. It may be remarked, in connection with this question, that the specimen in herb. Willdenow (n. 18598) upon which Willdenow based his description of *C. tenuifolia* is a cultivated one, and that Willdenow notes it as having been grown in a garden in England. Krauss, who in the case of most of the South African Cluytias known to him came to well considered conclusions, went very nearly as far astray as did Linnaeus; if the latter included *C. ericoides* in his *C. polygonoides*, the former included *C. polygonoides* in his *C. ericoides*. But Krauss treated the two as distinct varieties; *C. ericoides*, Krauss, is *C. polygonoides*, Linn., and *C. ericoides* var. *minor*, Krauss, is *C. ericoides*, Thunb.

2. **Cluytia nana**, *Prain*; suffrutex nanus, 7–10 cm. altus; ramuli crassiores, iterum intricatim ramosi, glaberrimi; folia sessilia, coriacea, ovata, acuta, basi rotundata, margine involuta, adpresse imbricata, 3 mm. longa, 2 mm. lata, subtus convexa subcarinata, supra altius concava, glaberrima; flores dioici; masculi solitarii, feminei nondum visi; pedicelli perbreves, glaberrimi; sepala maris ovata, cucullata, obtusa, squama basali 4-loba aucta; petala ovata, obtusa, unguiculata, glandula minima basi laminae apice unguis induta; ovarii rudimentum brevissimum, subglobosum, glabrum.

Kalahari Region: Orange River Colony; Mont aux Sources, 3000 m., *G. Mann in herb. Marloth*, 2870.

This very striking plant comes nearest to typical *C. ericoides*, Thunb., but, in addition to having a different habit and distinctive facies, both perhaps explicable by the considerable altitude at which it occurs, it is readily separated from all three varieties of that species on account of its perfectly glabrous young twigs.

¶2. **Tomentosae**, *Pax et K. Hoffm. in Engl. Pflanzenr.—Euphorb. Cluyt.* 75 (1911) *emend. et* C. Thunbergii *excl.*—Folia haud ericoidea, firme membranacea vel papyracea, tomentosa vel sericea, hebetia, margine plana vel raro (*C. Katharinae*) parum revoluta; petala feminei modo maris basi glandulosa; ovarium dense tomentosum; capsula tomentosa.—Species 4; *C. tomentosa*, *C. marginata*, *C. sericea*, *C. Katharinae*.

3. **Cluytia tomentosa**, *Linn. Mant.* ii. 299 [Clutia] (1771); *Lamk Encyc. Meth.* ii. 54 (1786); *Willd. Sp. Pl.* iv. 881, *excl. syn. Thunb.* (1805); *Pers. Synops.* ii. 636 (1807); *Spreng. Syst.* iii. 49 (1826); *Sond. in Linnaea*, xxiii. 131 (1850); *Dietr. Synops.* v. 455 (1852); *Baill. Étud. gén. Euphorb.* 31, t. 16, f. 20, 21 (1858) et *Adansonia*, iii. 152 (1863); *Müll. Arg. in DC. Prodr.* xv. 2, 1053, *var.* elliptica *incl.* (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 76, *var.* elliptica *omnino et var.* marginata *partim incl.* (1911). C. marginata, *E. Mey. in Drège, Zwei Pfl. Documente*, 174 [nomen], *quoad* b *tantum* (1843); *Sond.* l.c. 130, *partim et quoad spp. Dregeana in* Swellendam *lecta tantum* (1850). Penaea tomentosa, *Thunb. Prodr. Pl. Cap.* 30 (1794) et *in Fl. Cap. ed. Schult.* 150 (1823). Geissoloma tomentosum, *Juss. in Ann. Sc. Nat.* sér. 3, vi. 27 (1846).

Coast Region: Caledon, Bredasdorp and Swellendam Divs.

A double confusion has crept into the history of *C. tomentosa*. The species was based by Linnaeus on a male specimen despatched to him from the Cape by Governor Tulbagh on 25 April, 1763. This specimen is now in the Linnaean herbarium, where it bears Tulbagh's field number 129; it is written up as "tomentosa" by Linnaeus himself, and the same name is endorsed by Linnaeus opposite this number on Tulbagh's invoice list.

Subsequent to the publication of the description of Tulbagh's specimen in the second *Mantissa*, Linnaeus obtained from Thunberg a female specimen of a *Cluytia* which he wrote up as "tomentosa *Mant.* femina"; this specimen is still in the Linnaean herbarium. The latter, however, is not the female of *C. tomentosa*, Linn.; it has glabrous capsules, whereas the capsules of the true *C. tomentosa* are tomentose. What this second plant is has been a matter of debate. By Thunberg in his own herbarium a duplicate of this female plant, treated as *C. tomentosa*, doubtless on the strength of Linnaeus' verdict, has been pinned to a sheet bearing a male plant of *C. daphnoides*, Lamk. Sonder, in 1850, while leaving the male part of *C. tomentosa*, Thunb. non Linn., in *C. daphnoides*, has attributed the female part to a species issued, though with an expression of doubt, by E. Meyer in 1843, as *C. tomentosa*: upon *C. tomentosa*, E. Mey., non Linn., Sonder based his species *C. Thunbergii*, the name chosen having regard to the inclusion therein of the female portion of *C. tomentosa*, Thunb. non Linn. Müller, on the other hand, while recognising in 1866, as a distinct variety, the form which is *C. tomentosa*, E. Mey. non Linn., referred the female portion of *C. tomentosa*, Thunb. non Linn., as well as the male portion, to *C. daphnoides*. We have in this paper adopted Sonder's view rather than that of Müller, though with a feeling that perhaps the proper course to adopt is to regard the female part of *C. tomentosa*, Thunb. non Linn., as intermediate between *C. daphnoides*, Lamk., and *C. Thunbergii*, Sond., rather than as belonging to either. Sonder's view had, however, in a somewhat different form, been already formed and expressed by Willdenow. In herb. Willdenow there is a specimen (No. 18599) which matches exactly the one sent by Thunberg to Linnaeus. This specimen, like the female one of *C. tomentosa*, Thunb. non Linn. in herb. Thunberg, Müller has identified as *C. daphnoides*. But to Willdenow himself, who knew *C. daphnoides* quite well, and who actually published a good figure of that species, this specimen did not suggest *C. daphnoides* any more than it did *C. tomentosa*. Knowing that Thunberg had diagnosed a pubescent species as *C. pubescens*, and being without any example of that plant, Willdenow hazarded the guess that the plant in his herbarium which Sonder was, later on, to include in *C. Thunbergii*, Sond., might be *C. pubescens*.

The second confusion, to some extent a corollary of the first, was imported into the history of *C. tomentosa* by E. Meyer. Having come to the conclusion that the plant which Sonder was subsequently to describe as *G. Thunbergii* might be *C. tomentosa*, it is hardly surprising that when he did have to deal with the true *C. tomentosa*, Linn., Meyer failed to recognise it as being the plant of Linnaeus and issued it among Drège's plants, in 1843, under the manuscript name *C. marginata*, E. Mey. In so doing, however,

he confused it with another nearly allied but nevertheless distinct species. Sonder, in 1850, failed to observe that Meyer had issued two different plants under this name. Müller, in 1866, noticed the misidentification by Meyer which Sonder had accepted and treated that portion of *C. marginata*, E. Mey., which is not *C. tomentosa*, Linn., as *C. tomentosa*, var. *marginata*, Müll. Arg.; the portion of *C. marginata*, E. Mey., which is identical with *C. tomentosa*, Linn., was named by Müller *C. tomentosa*, var. *elliptica*, Müll. Arg. As Pax in 1911 has pointed out, there is no variety "elliptica" as apart from *C. tomentosa*, Linn., proper. Pax has not, however, given full effect to this conclusion; Drège's specimens from Swellendam, which are those upon which the variety *elliptica*, Müll. Arg., was founded, have been transferred by Pax from the variety of which they constitute the basis and placed by him in the variety *marginata*, from which Müller was careful to exclude them. By some inadvertence Pax has attributed the first publication of *C. tomentosa* to the *Mantissa Plantarum* of 1767 instead of to the actual place, which is the *Mantissa altera* of 1771.

4. **Cluytia marginata**, *E. Mey. in Drège, Zwei Pfl. Documente*, 174 [nomen], *quoad* a *tantum* (1843); frutex metralis; ramuli patentes, angulati, dense cinereo-tomentosi; folia firmiter papyracea, breviter petiolata, obovata, acuta, basi pedetentim cuneata, margine plana, patentia haud imbricata, 1·2–2·5 cm. longa, 6–8 mm. lata, utrinque dense cinereo-pubescentia; petiolus 2 mm. longus; flores dioici, albi, masculi axillares 1-3, feminei axillares solitarii; pedicelli breves, incanescenti-pubescentes; sepala maris dense incanescenti-pubescentia, ovato-oblonga, 5 mm. longa, glandula basali 7–9-loba aucta; petala distincte unguiculata, rhomboidea, extra parce pubescentia, glandula minuta instructa; ovarii rudimentum cylindricum, parce pubescens; sepala feminei ovato-oblonga, glandula basali indivisa aucta; petala calyce aequilonga, oblonga, extra pubescentia, glandula basali 2-loba aucta; ovarium tomentosum; styli breves, 2-fidi; capsula 8 mm. longa, fere 8 mm. lata, parce breviter tomentosa; semina nigra, nitentia. *Sond. in Linnaea*, xxiii. 130, *pro parte maxima, sed. spp. Drègeana in* Swellendam *lecta excl.* [nomen] (1850); *Baill. Adansonia*, iii. 152 [nomen] (1862). C. tomentosa, *var.* marginata, *Müll. Arg. in DC. Prodr.* xv. 2, 1053, *omnino* (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 76, *partim* (1911). C. incanescens, *Hort. in hort. Kew.*

Coast Region: Ladismith Div.; Kannaland, between Cogman's Kloof and the Gouritz River, *Ecklon & Zeyher*, 67. George Div.; Montagu, *Marloth*, 2831.

Central Region: Beaufort West Div.; Nieuweveldebergen near Beaufort West, 3000–5000 ft., *Drège*, letter a.

This species, after having been in cultivation at Kew in the early part of the nineteenth century under the name *C. incanescens*, seems to have been lost without being replaced. The specimens collected by Marloth in 1903 agree well with those of Ecklon and Zeyher from Kannaland and those of Drège from Beaufort West. Specimens raised at Berlin from seed of Marloth 2831 agree very well with *C. incanescens*, Hort., preserved at Kew. No full description of this species has so far beer given.

5. **Cluytia sericea,** *Müll. Arg. in DC. Prodr.* xv. 2, 1053 (1066); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 75, fig. 24 A (1911).
Coast Region: Malmesbury Div.

6. **Cluytia Katharinae,** *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 58 (1911). C. sericea, *Harv. MSS. in T. C. D.*; *non Müll. Arg.*
Coast Region: Queenstown Div.
Eastern Region: Pondoland, Griqualand East and Natal.

¶ 3. **Alaternoideae,** *Pax et K. Hoffm. in Engl. Pflanzenr.—Euphorb. Cluyt.* 67 (1911), *ampl. et emend. et* C. crassifolia *exclus.*—Folia haud ericoidea, coriacea, glabra vel rarissime (*C. pubescens*) pubescentia, opaca vel raro (*C. pterogona*) pellucido-punctata, margine nunc plana nunc revoluta; petala feminei basi eglandulosa; ovarium glabrum vel raro (*C. pubescens*) hirsutum; capsula glabra vel raro (*C. pubescens*) parce tomentosum. *Revolutae,* Pax et K. Hoffm. l. c. (1911) sed *C. polygonoide* exclus.—Species 11; *C. pubescens, C. pterogona, C. polifolia, C. brevifolia, C. virgata, C. laxa, C. africana, C. Alaternoides, C. imbricata, C. rubricaulis, C. ovalis.*

7. **Cluytia pubescens,** *Thunb. Prodr. Pl. Cap.* 53 [Clutia] (1794) et *in Fl. Cap. ed. Schult.* 270 (1823); *Krauss in Flora,* xxviii. 82 (1845); *Sond. in Linnaea,* xxiii. 124, *var.* β glabrata *incl.* (1850); *Baill. in Adansonia,* iii. 152, *var.* β glabrata *incl.* (1862); *Müll. Arg. in DC. Prodr.* xv. 2, 1053 (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 80 (1911). C. acuminata, *E. Mey. in Drège, Zwei Pfl. Documente,* 174, *partim et quoad* b *tantum*; *nec Linn. f., nec Thunb.* (1843). C. humilis, *Bernh. ex Krauss* l.c. 81 (1845). C. Eckloniana, *Müll. Arg.* l.c. 1054 (1866). C. Rustii, *Knauf, Geogr. Verbr. Cluytia,* 49, 54 (1903). C. glabrata, *Pax* l.c. (1911). C. intertexta, *Pax* l.c. (1911). C. fallacina, *Pax* l.c. (1911).
Coast Region: Van Rhynsdorp, Piquetberg, Tulbagh, Paarl, Cape, Stellenbosch, Caledon, Riversdale and Fort Beaufort Divs.
Central Region: Prince Albert and Cradock Divs.

8. **Cluytia pterogona,** *Müll. Arg. in DC. Prodr.* xv. 2, 1048, *var. amb. inclus.* (1866); *Pax. in Engl. Pflanzenr.—Euphorb. Cluyt.* 78, fig. 26 F, *var. amb. incl.* (1911). C. alaternoides, *Willd. Sp. Pl.* iv. 879 *partim*; *nec Linn.* (1805). C. alaternoides, γ [angustifolia], *E. Mey. in Drège, Zwei Pfl. Documente,* 174, *quoad* b *tantum* (1843). C. polygonoides, var. heterophylla, *Krauss in Flora,* xxviii. 82 (1845). C. polygonoides, var. angustifolia, *Krauss* l.c., *partim et quoad spp. capens. tantum* (1845). C. alaternoides, γ lanceolata, ββ revoluta, *Sond. in Linnaea,* xxiii. 128, *partim et loc. omn. excl.* (1850). C. polifolia, *Sond.* l.c. 124 (1850); *Baill. Adansonia,* iii. 151 (1862); *nec. Jacq.* C. lavandulifolia, *Reichb. MSS. ex Pax* l.c. (1911).
Coast Region: Paarl and Cape Divs.
This species resembles so closely the plant which is known as *C. Alaternoides,* γ *angustfolia,* E. Mey., that the two have been confused both by Meyer himself and by Krauss. However, these authors were not the earliest to make this mistake, because the opening folio of herb. Willdenow n. 18592, intended by Willdenow to represent *C. Alaternoides,* Linn., is really *C. pterogona* Müll. Arg. Sonder, in 1850, was the first to realise that this is a distinct species, though he was so unfortunate as to decide that it was the plant figured by Jacquin in 1797 as *C. polifolia.* As a result

Sonder not only was prevented from providing *C. pterogona* with the distinctive name of which it stood in need; he was led to propose an unnecessary name for the real plant of Jacquin, from which among other things *C. pterogona* differs in having leaves with translucent patches and stems with erosely-denticulate wings.

When rectifying Sonder's misapprehension Müller, in 1866, cited for his newly named species only localities in the Cape Peninsula. In so doing it would appear that Müller was very nearly justified; the only division, outside the limits of the Cape Peninsula, whence perfectly authentic examples of *C. pterogona* have been reported, is Paarl. An examination of the evidence available shows that it is only the Table Mountain (Cape Div.) portion and not, as Sonder has stated, the Winterberg (Fort Beaufort Div.) portion of 'Ecklon & Zeyher n. 62' which belongs to this species: also, that it is only the Cape Flats (Cape Div.) portion of *C. polygonoides*, var. *angustifolia*, Krauss, and not, as Pax has been led to believe, the Winterhoek (Uitenhage Div.) portion of Krauss' variety that is referable to *C. pterogona*. It has, however, to be added that there is now in herb. Holm. a specimen of *C. pterogona*, which once belonged to Sonder, which bears the notation 'E. & Z. 64. 9' and therefore, if this notation be correct, ought to have come from the banks of the Karega River (Bathurst Div.). But this record is so doubtful that until authentic evidence to the contrary is forthcoming we are disposed to assume that the species is, as Müller supposed, confined to the extreme south-west of Cape Colony, and to doubt the extension eastwards (by oversight written 'westwards') to Grahamstown which Pax has postulated. The recognition of two varieties, insisted upon by Müller and by Pax, is unnecessary. As in most other species of the group to which it belongs the leaves on young twigs of *C. pterogona* are manifestly shorter than the leaves on the main branches. But all specimens do not happen to have young twigs developed when they are collected. If a specimen chances to be without young twigs its leaves are uniform in length; if it happens to have developed its young twigs its leaves are of different lengths and the plant is in the condition—for it is only a condition—to which Krauss, Müller and Pax have given the varietal name "heterophylla."

9. **Cluytia polifolia**, *Jacq. Hort. Schönbr.* ii. 67, t. 250 (1797). *Willd. Sp. Pl.* iv. 2, 880 (1805); *Pers. Synops.* ii. 636 (1807); *Poir. Encyc. Meth. Suppl.* ii. 302 (1810); *Spreng. Syst.* iii. 49 (1826); *Dietr. Synops.* v. 455 (1852). C. polifolia, *a* genuina, *Müll. Arg. in DC. Prodr.* xv. 2, 1049 (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 77 (1911). C. acuminata, *E. Mey. in Drège, Zwei Pfl. Documente*, 174, *quoad* a *tantum* (1843) et *ex Sond. in Linnaea*, xxiii. 25, *omnino* (1850); *nec Linn. f., nec Thunb.* C. teretifolia, *Sond.* l.c. 124 (1850); *Baill. Adansonia*, iii. 152 (1862). C. brevifolia, *Sond.* l.c. 125, *pro parte minima et quoad Drège* 8230 *tantum* (1850). C. Meyeriana, *Müll. Arg.* l.c. 1055 (1866); *Pax* l.c. 79 (1911). C. polifolia, β teretifolia, *Müll. Arg.* l.c. (1866); *Pax* l.c. (1911). C. polifolia, γ cinerascens, *Müll. Arg.* l.c. (1866); *Pax* l.c. (1911). C. polifolia, δ brevifolia, *Pax* l.c., *pro parte minima et quoad Diels* 595 *tantum* (1911).

Coast Region : Van Rhynsdorp, Clanwilliam, Piquetberg, Malmesbury, Worcester, Swellendam, Riversdale, George, Knysna, Uniondale, Uitenhage and Port Elizabeth Divs.

Central Region : Prince Albert Div.

C. polifolia is most nearly allied to *C. pterogona*, Müll. Arg. but is readily distinguished by its unwinged stems and its opaque leaves. It is noteworthy that, widely spread as *C. polifolia* is, there are no specimens from the particular area to which *C. pterogona* appears to be confined. The variety β *teretifolia*, recognised by Müller, has no real existence, its origin being purely bibliographical. Sonder in 1850 believed the species which is really *C. pterogona* to be *C. polifolia*, Jacq., and wrote up his material in accordance with this belief. Being thus left without a name for Jacquin's species, Sonder took the latter to be a novelty which he described as *C. teretifolia*. As in *C. pterogona*, the leaves on young twigs of *C. polifolia* are manifestly shorter than the leaves on the main branches. If, as chances to have been the case with the plant figured by Jacquin, young twigs are not yet developed, then the leaves are uniform in length. When there are young twigs the leaves thereof are shorter than those of the main-branches and we have the condition—for it is only a condition—to which Müller in 1866 gave the specific name *C. Meyeriana*. The plant which Müller in 1866 treated as γ *cinerascens* is a somewhat robust and unusually rigid state of *C. polifolia*, almost as little entitled as *C. Meyeriana* is to separate recognition. On the other hand the reduction by Müller of *C. brevifolia*, Sond., to the position of a variety of *C. polifolia* is very nearly as inconvenient as the proposed recognition, as a species apart, of *C. Meyeriana*.

10. **Cluytia brevifolia**, *Sond. in Linnaea*, xxiii. 125, *cit. Drège* 8230 *excl.* (1850) ; *Baill. Adansonia*, iii. 153 *excl. syn. E. Mey.* (1862). C. polifolia, δ brevifolia, *Müll. Arg. in DC. Prodr.* xv. 2, 1049 (1866) ; *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 77 (1911).

Coast Region : Humansdorp, Uitenhage and Port Elizabeth Divs.

Though treated by Müller as a variety of *C. polifolia*, Jacq., this seems a very distinct species with a somewhat limited and quite compact distribution. The localities Grahamstown and Stellenbosch, cited for *C. brevifolia* by Sonder, prove, on critical examination, to depend upon a misapprehension on Sonder's part as to the provenance of his specimens. Similarly the plants from the Van Rhynsdorp and Clanwilliam Divs., referred here by Pax, are found on examination not to belong to *C. brevifolia*, but to the condition of *C. polifolia* which Müller termed *C. Meyeriana*. Sonder himself has made a suggestion that *C. imbricata*, E. Mey., might perhaps be a form of *C. brevifolia* ; this suggestion Baillon ventured to give effect to. We now know that whatever its taxonomic relationship to *C. brevifolia* may be, *C. imbricata*, E. Mey. differs morphologically from *C. brevifolia* in having stomata on both surfaces of its leaves.

11. **Cluytia virgata**, *Pax et K. Hoffm. in Engl. Pflanzenr.—Euphorb. Cluyt.* 71 (1911).

Kalahari Region : Transvaal ; Ermelo, Barberton and Swaziland Dists.

Eastern Region : Pondoland and Natal.

A species very closely allied to and perhaps hardly specifically distinct from *C. Alaternoides*, Linn. It is readily recognised by having simple in place of branching stems. It has, however, to be borne in mind that this is a character such as might be expected in a plant sending up fresh shoots from a woody base after veldt fires.

12. **Cluytia laxa**, *Eckl. ex Sond. in Linnaea*, xxiii. 128 (1850); frutex 30–60 cm. altus; caules graciliores, lignosi, crebre ramosi; ramuli subpatentes, glabri; folia sessilia, coriacea, opaca, lanceolata, obtusa apice mucronulata, basi roundata, margine parce scabridula saepissime plana, 6–12 mm. longa, 3–4 mm. lata, utrinque glaberrima, pallide viridia; internodia vix angulata vix 3 mm longa; flores dioici, albi, subsessiles, maris in glomerulas paucifloras aggregati; feminei solitarii; utriusque sexus versus ramulorum apices densiusculc aggregati; sepala maris obovata, obtusa, glandula basali 3-loba aucta, petala late obovata, cuneatim unguiculata, basi 2-glandulosa; ovarii rudimentum glabrum; sepala feminei elliptico-lanceolata, ea maris superantia, glandula basali 3-loba aucta; petala oblongo-obovata, eglandulosa; ovarium glabrum; styli liberi, 2-fidi; capsula subglobosa, 4 mm. lata; semina nigra, nitentia. C. Alaternoides, *Sims*, *Bot. Mag.* t. 1321 (1810); *Ait. Hort. Kew.* ed. 2, v. 422, *partim* (1813); *nec Linn.* C. Alaternoides, β intermedia, *Sond.* l.c., *pro parte maxima* (1850); *Baill. Adansonia*, iii. 150 (1862). C. Alaternoides, γ lanceolata, *aa* planifolia, *Sond.* l.c. *syn. Willd. excl.* (1850); *Baill.* l.c. (1862). C. alaternoides, ζ lanceolata, *Müll. Arg. in DC. Prodr.* xv. 2, 1048 (1866). C. alaternoides, γ angustifolia, 1 lanceolata, *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 70, fig. 22 B (1911); *nec* γ angustifolia, *E. Mey.*

Coast Region: Riversdale Div., Garcia's Pass, *Phillips*, 370. Oudtshoorn Div.; near Oudtshoorn, *Miss Britten*, 89. Knysna Div.; near Knysna, *Newdegate*. Uitenhage Div.; Uitenhage, *Ecklon & Zeyher*, 42: Elands River, *Ecklon*; *Ecklon & Zeyher*, 59. Port Elizabeth Div.; near Port Elizabeth, *Bolus*, 2243; *Mrs. Paterson*, 1109; Walmer, *Mrs. Paterson*, 832. Albany Div.; at Soutar's Post, *Burchell*, 3504; Grahamstown, *Williamson*; *Macowan*, 27; *Rogers*, 66, 3995; Stone's Hill, *Schönland*, 72; Currie's Kloof, *Schönland*, 576; Kaboussie, *Macowan*, 325; Harvey's Post, *Galpin*, 78. Queenstown Div.; Hangklip Mountains, 1600–2000 m., *Galpin*, 1621, 1622; Stormberg, *Wyley*. Stutterheim Div.; Fort Cunynghame, *Sim*, 2180. Komgha Div.; near the mouth of the Kei River, 60 m., *Flanagan*, 1149. British Kaffraria; without precise locality, *Cooper*, 78, 79.

Kalahari Region: Transvaal; Lydenburg, *Wilms*, 1318. Barberton, 900 m., *Galpin*, 934.

Eastern Region: Transkei; Kentani, 300 m., *Miss Pegler*, 1250. Natal; Alexandra County, Dumisa, at Fairfield, 750 m., *Rudatis*, 679; between Pietermaritzburg and Greytown, *Wilms*, 2270.

Though *C. laxa*, Eckl., has already been fully described and figured by Sims in 1810 in the *Botanical Magazine* it was there confused with and, at least in intention, treated as part of *C. Alaternoides*, Linn. The first author to recognise the claim of this plant to separate recognition was Müller, who, in 1866, treated it as a distinct variety of the Linnean species. Pax, in 1911, declining to

accept Müller's arrangement, has merged this plant in Müller's var. *angustifolia*. This treatment is rather less natural than that of Müller because, as will be shown presently, it is var. *angustifolia*, Müll. Arg., and not, as Müller supposed, the variety which Müller termed γ *genuina*, which is the true *C. Alaternoides* of Linnaeus. Pax has treated *C. Alaternoides* as the type of a distinct section, *Alaternoideae*, which by his definition is only separable from another section, *Revolutae*, also proposed by him, owing to the circumstance that in the *Alaternoideae* the leaves bear stomata on both surfaces, whereas in the *Revolutae* the leaves bear stomata only on the under surface. It so happens, however, that in *C. laxa* the stomata are almost always confined to the lower surface of the leaves only, and if this character, which is of interest owing to its possible oecological significance, had all the taxonomic value which Pax has assigned to it, then *C. laxa*, so far from being treated as 'a form of a variety' of *C. Alaternoides*, might be treated as a distinct species belonging to another section. The writer is not disposed to consider the character afforded by the distribution of the stomata as one of sufficient importance to justify the establishment of sections, but when, as in the present instance, it is found associated with certain other adequate morphological peculiarities, we are perhaps justified in regarding *C. laxa*, Eckl., at least tentatively, as a distinct species. But the natural relationships of these various nearly allied Cluytias can only be settled in the field by one or other of the competent local botanists now at work in South Africa.

13. **Cluytia africana**, *Poir. Encyc. Meth. Suppl.* ii. 302 [Clutia], *syn. Willd. excl.* (1810); suffrutex ad 60 cm. altus; caules crassi, lignosi, saepius copiose ramosi; ramuli ascendentes, glabri; folia sessilia, crasse coriacea, opaca, oblongo-obovata, obtusa apice mucronulata, basi cuneata rarius rotundata rarissime minopere cordata, margine scabridula parum revoluta, 4–4·5 cm. longa, 1·2–1·8 cm. lata, utrinque glaberrima, hebetia, siccitate brunnea; internodia 5–10 mm. longa; flores dioici, pallide lutei, utriusque sexus solitarii, pedicellati; pedicelli glabri, 5 mm. longi, maris graciles, feminei fructigeri rigidi robustiores; sepala maris obovata, obtusa, basi glandula 3-loba aucta; petala late obovata, cuneatim unguiculata, basi 2-glandulosa; ovarii rudimentum turbinatum, glabrum; sepala feminei elliptico-lanceolata, ca maris superantia, basi glandula 3-loba aucta; petala oblongo-obovata, eglandulosa; ovarium glabrum; styli liberi, 2-fidi; capsula subglobosa, 5 mm. lata, glabra; semina nigra, nitentia. C. Alaternoides, *Linn. Sp. Pl.* 1042, *partim et quoad syn. Comm. tantum* (1753) et *ibid.* ed. 2, 1475, *partim et quoad syn. Comm. tantum* (1763); *Lamk Encyc. Meth.* ii. 54, *partim et quoad syn. Comm. tantum* (1786); *Thunb. Prodr. Cap.* 53, *pro parte maxima* (1794), et *Fl. Cap. ed. Schult.* 270, *pro parte maxima* (1823); *E. Mey. in Drège, Zwei Pfl. Documente*, 174, *quoad* a *et* d *tantum* (1843); *Krauss in Flora*, xxviii. 82 (1845). C. daphnoides, *Willd. in Hort. Berol.* 52, *excl.* t. 52 (ante 1805), et *Sp. Pl.* iv. 2, 880, *quoad syn. Comm. tantum* (1805); *nec Lamk* C. Alaternoides, *var.* major, *Krauss* l.c. (1845); *Müll. Arg. in DC Prodr.* xv. 2, 1047 (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 68, *pro parte maxima* (1911). C. Alaternoides, *a* latifolia, *Sond. in Linnaea*, xxiii. 127, *partim* (1850); *Müll. Arg.* l.c. (1866).

C. floribunda, *Baill. Étud. gén. Euphorb. Atl.* 30, t. xvi. fig. 1–5 (1858); *fide Pax.* C. heterophylla, *Baill. Adansonia*, iii. 150, *quoad spp. cit. sed syn. Bernh. excl.* (1862); *nec Thunb.* C. Alaternoides, γ genuina, b oblongata, *Müll. Arg.* l. c. (1866).

Coast Region: Clanwilliam Div.; Cedarberge, near the Honey Valley and the Koudeberg, 800–1200 m., *Drège*, 8228 b; *Diels*, 906. Piquetberg Div.; near Piquetberg, *Drège*, 8228 a: Oliphants River near Warm Baths, *Stephens*, 7223; *Phillips*, 7254. Paarl Div.; Paarl Mountain and by the Berg River near Paarl, *Drège*. Cape Div.; numerous localities, *Sparrmann*; *Thunberg*; *Bergius*; *Mund & Maire*; *Lichtenstein*; *Drège*, a; *Burchell*, 260; *Ecklon*; *Ecklon & Zeyher*; *Prior*; *Pappé*; *Hooker*, 616; *Harvey*, 24, 112; *C. Wright*, 452; *Dubuc*; *Bolus*, 4586; *Miss Cole*; *Rehmann*, 1394, 2028; *Wolley Dod*, 608, 2743 in part, 2799; *Wilms*, 3612; *Dümmer*, 27, 97, 1449, 1451. Stellenbosch Div.; Hottentots Holland, *Mund & Maire.*

In herb. Holm. there is a specimen of this plant marked in an unrecognised script "Gueinzius 205" and subsequently noted by Sonder as being also from Hottentots Holland. In herb. Berol. another specimen is marked "Eckl. & Zeyh. 49. 93. 3" the locality of which, if these figures were correct, should be Port Elizabeth. But there is no corroboration of this rather unexpected distribution and the Port Elizabeth locality should be considered doubtful.

Cluytia africana was well figured by Commelin (Hort. Amst. ii. 3, t. 2) in 1701, but was treated by Linnaeus in 1753 and again by Lamarck in 1786 as only a form of another species well figured by Burmann (Rev. Afr. Pl. 116, t. 43, fig. 1) in 1739. Though Linnaeus proposed this bibliographical union he did not, as we now know, associate any specimens of Commelin's plant with that of Burmann, and it is therefore hardly matter for surprise that Willdenow should have been unable to accept the arrangement of Linnaeus and Lamarck. But Willdenow only escaped the confusion his predecessors had created in order to give rise to another, because he identified Commelin's plant, sometime prior to 1805 (Hort. Berol. 52), with one which Lamarck had described as *C. daphnoides.* This new error was corrected by Poiret in 1810 (Encyc. Meth. Suppl. ii. 302), though Poiret was led into yet a third because of his assuming that the *C. daphnoides* of Willdenow could not well be the *C. daphnoides* of Lamarck. In coming to this conclusion Poiret's own judgment was at fault for the plant figured by Willdenow as *C. daphnoides* is really the plant described under that name by Lamarck. Poiret's action was consistently ignored until 1866, when Müller, failing to observe that Poiret's error lay in his having been misled in his estimate of Willdenow's judgment, misunderstood and misinterpreted Poiret's proposition. In 1845 Krauss, who does not quote Poiret, arrived independently at the same conclusion and treated *C. africana* as distinct from *C. Alaternoides*; unfortunately it was to *C. africana* that Krauss attributed the name "Alaternoides" while the real *C. Alaternoides* he included in *C. polygonoides*, Krauss, his conception of which was the same as that of Willdenow and therefore altogether different from that of Linnaeus. In applying the name *C. Alaternoides* to this particular plant Krauss was only doing what, as we learn from their specimens, Thunberg and E. Meyer

intended to do and Burchell actually did. Nor is the reason for the action of these authorities difficult to understand. Being without access to the Linnaean herbarium, they had not learned that this plant is not the one which there serves as a representative of *C. Alaternoides*, Linn., or that Linnaeus, when he did finally obtain specimens of this plant, had not ventured to write it up as *C. Alaternoides*. All that they did know, and all that they had to guide them, was the circumstance that the plant with which they were dealing was the plant to which Commelin had given the name—*Alaternoides*—which Linnaeus used for it. In 1858 Baillon, again independently, reached the sound conclusion of Poiret and of Krauss, for *C. floribunda*, Baill., is identical with *C. africana*, Poir. In 1862 Baillon was still of the same opinion because, though he abandoned the name *C. floribunda*, his specimens show us that what he took to be *C. heterophylla* was not the true *C. heterophylla* of Thunberg but was *C. africana*, Poir. Krauss in 1845 separated from the others as var. *major* those specimens of *C. africana* with very large leaves ; Sonder in 1850 recognised a variety, *α latifolia*, of *C. alaternoides*, Linn. Müller in 1866 adopted both the variety *latifolia* of Sonder and the variety *major* of Krauss. In so doing Müller treated Sonder's *latifolia* as the equivalent of *C. Alaternoides*, Krauss, non Linn., and took *C. Alaternoides β major* of Krauss to be the precise equivalent of Commelin's plant named by Poiret *C. africana*. This was an error of refinement. There is no doubt that what Sonder termed *C. Alaternoides α latifolia* was intended to include, and his specimens show that it did include, both *C. Alaternoides*, Krauss, non Linn., and *C. alaternoides β major*, Krauss. On the other hand there is no doubt that except in size of leaf there is no difference between Krauss's two varieties and that both belong to the plant figured by Commelin and named *C. africana* by Poiret. The action of Pax, in his careful study of the forms that have from time to time been labelled *C. Alaternoides*, in treating as a single entity the two varieties, *latifolia* and *major* of Müller, is therefore fully justified ; he has thus reverted to the position taken up by Poiret in 1810, by Krauss in 1845, and by Baillon in 1858 and 1862, with this difference that Pax, like Sonder, has treated as a variety of *C. Alaternoides* what Poiret and Krauss and Baillon have, under various names, regarded as a distinct species. In adopting the view of Poiret and Baillon in preference to that of Sonder and Pax, and in treating *C. africana* as a distinct species, no regard has been paid to the fact that *C. africana*, Poir., is another of those species with stomata on the under surface of the leaf only and not on both surfaces, as is the case in *C. Alaternoides*, Linn., the species with which *C. africana* has been so greatly confused.

14. **Cluytia Alaternoides**, *Linn., Sp. Pl.* 1042, *syn. Burm.* t. 43, fig. 3 *et syn. Comm. excl.* [Clutia] (1753), et *ibid. ed.* 2, 1474, *syn. eadem excl.* (1763) ; *Burm. f. Prodr. Fl. Cap.* 27 bis [31] (1768) ; *Lamk Encyc. Meth.* ii. 54, *syn. Comm. excl.* (1786) ; *Ait. Hort. Kew*, iii. 419 (1789) ; *Willd. Hort. Berol.* 50, t. 50 (ante 1805), et *Sp. Pl.* iv. 2, 879, *partim* (1805) ; *Pers. Synops.* ii. 636 (1807) ; *Ait. Hort. Kew*, ed. 2, v. 422 *partim* (1813) ; *Spreng. Syst.* iii. 49 (1826) ; *E. Mey. in Drège, Zwei Pfl. Documente*, 174, *quoad* a a *partim et quoad* c (1843); *Dietr. Synops.* v. 455 (1852) ; *Baill. Adansonia*, iii. 150, *quoad syn.*

Willd. (1862). C. polygalaefolia, *Salisb. Prodr.* 390 (1796). C. Alaternoides, β intermedia, *Sond. in Linnaea*, xxiii. 128, *quoad syn. Burm. sed excl. syn. E. Mey.* (1850). C. Alaternoides, γ lanceolata, Sond., l.c. *quoad syn. Willd. tantum* (1850). C. Alaternoides, ε angustifolia, a longifolia, *Müll. Arg. in DC. Prodr.* xv. 2, 1048 (1866); *nec tamen* γ angustifolia, *E. Mey.* C. Alaternoides γ angustifolia, 1 lanceolata, *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 70 *pro parte* (1911); *nec* γ angustifolia, *E. Mey.* C. angustifolia, *Burch. MSS. in herb. Kew, nec Knauf.*

Coast Region: Clanwilliam, Piquetberg, Worcester, Paarl, Cape, Caledon, Riversdale, George, Knysna, Uitenhage, Bathurst and Albany Divs.

Eastern Region: Transkei.

Var. β **brevifolia,** *E. Mey. ex Sond. in Linnaea*, xxiii. 128 (1850); frutex elatus, 2–3-metralis; caules ramulique typi; folia typi nisi breviora—longitudine nunquam 1·2 cm. excedentia saepissime breviora; internodia saepe manifeste angulata nonnunquam alata. C. Alaternoides, *Thunb. Prodr. Fl. Cap.* 53, *partim* (1794) et *in Fl. Cap. ed. Schultes* 270, *partim* (1823); *vix Linn.* C. Alaternoides, β [brevifolia], *E. Mey. in Drège, Zwei Pfl. Documente*, 174, *quoad* a *tantum* [nomen] (1843). C. Alaternoides, γ genuina, c brevifolia, *Müll. Arg. in DC. Prodr.* xv. 2, 1048 (1866). C. Alaternoides, γ genuina, c imbricata, *Mull. Arg.* l.c. (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 70 (1911). C. Alaternoides, β genuina, 3 elliptica, *Pax* l.c., *partim* (1911); *nec Müll. Arg.* C. angulata, *Burch. MSS.* C. myrtifolia, *Burch. MSS.*

Coast Region: Paarl, Cape, Stellenbosch, Caledon, Swellendam, George, Knysna, Uitenhage and Albany Divs.

Var. γ **angustifolia,** *E. Mey. ex Sond. in Linnaea*, xxiii. 128, *pro parte tantum* (1850); frutex elatus; caules ramulique typi; folia longitudine nunquam 8 mm. excedentia, margine manifeste revoluta; internodia manifeste angulata vel subalata sed angulis vix membranaceis nunquam eroso-denticulatis. C. Alaternoides, γ [angustifolia], *E. Mey. in Drège, Zwei Pfl. Documente*, 174, *quoad* a *tantum* [nomen] (1843). C. Alaternoides, γ lanceolata, ββ revoluta, *Sond.* l. c., *pro parte tantum* (1850). C. Alaternoides, ε angustifolia, c leptophylla, *Müll. Arg. in DC. Prodr.* xv. 2, 1048 (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 70 (1911).

Coast Region: Mossel Bay Div.

In the account which has already been given of the specimens in the Linnean herbarium the necessity for restricting the name *C. Alaternoides* to the first of the three distinct species to which the name was applied in 1753 has been explained. In the account of the Thunbergian herbarium it has already been noted that although *C. Alaternoides*, Thunb., also includes three forms, none of Thunberg's plants is precisely *C. Alaternoides*, Linn.; the nearest to the Linnean plant in Thunberg's herbarium is one which is referable to *C. Alaternoides*, β *brevifolia*, E. Mey.

C. Alaternoides was early introduced to European gardens for, in spite of the possibility of confusion between it and other nearly allied species, we learn from Burmann's figure that it was in cultivation in Holland in 1738 (Rar. Afr. Pl. 116, t. 43, fig. 1), and from Willdenow's figure (Hort. Berol. 50, t. 50) that it was

in cultivation in Germany before 1805. From specimens we know that this is the *C. Alaternoides* of the first edition of the *Hortus Kewensis* (1789) and is the *C. polygalaefolia* of Salisbury's Chapel Allerton *Prodromus* (1796). From Willdenow we learn (Hort. Berol. 51, t. 51) that a nearly allied species, *C. rubricaulis*, was in cultivation at Berlin prior to 1805, under the erroneous name *C. polygonoides*; and from specimens we learn that this same species, under the equally erroneous name *C. Alaternoides*, was in cultivation from 1820 to 1822 in Paris. But *C. rubricaulis* was not the first species to find its way into our gardens under the name of the older *C. Alaternoides*; sometime before 1810 yet another species, *C. laxa*, had found its way to England, there to be mistaken for *C. Alaternoides* and to be figured by Sims under that name.

There is no serious difficulty, when some attention is paid to their leading characteristics, in separating *C. Alaternoides* from the particular variety of *C. rubricaulis* (*C. rubricaulis* var. *grandifolia*) with which it has, on the whole, been most often confused. The mixture of *C. Alaternoides* with *C. africana*, Poir., on the one hand, or with *C. laxa*, Eckl., on the other, is less difficult to avoid. It is, however, a matter for discussion whether *C. Alaternoides* may not, after all, in spite of the absence of any character readily appreciable in the herbarium, be even more distinct from the two varieties proposed by E. Meyer and here recognised than it is from the various species above alluded to. The only really tangible feature, so far as specimens and field-notes go, which enables the separation of the original *C. Alaternoides*, Linn., from E. Meyer's varieties β *brevifolia* and γ *angustifolia*, seems to be the circumstance that the plant of Burmann and Linnaeus is a small undershrub 1–2 feet high, whereas the other two are shrubs 7–10 feet high. It will be noted that in the field Burchell, whose *C. Alaternoides*, as has been already explained, was really *C. africana*, Poir. (*Alaternoides africana*, &c., Comm.), judged the true *C. Alaternoides* to be a species distinct both from *C. africana* on the one hand, and from E. Meyer's two varieties on the other. It will be noted further that Burchell has not, in the field, distinguished E. Meyer's two varieties, both of which he actually collected, from each other, but that he has applied two names in the field to E. Meyer's var. β *brevifolia*. These names are, however, so used by Burchell as to suggest that he may have intended to treat his "*C. angulata*" as only a variety of his "*C. myrtifolia*" and that he may therefore have thought of subdividing his *myrtifolia* along a different cleavage plane from that selected by E. Meyer. More than one competent South African field-botanist has expressed to the writer his conviction that there must be something seriously amiss with a systematic scheme, elaborated in a herbarium, which treats as conspecific the dwarf *C. Alaternoides* of the Cape Peninsula and the ten-foot bush which is so characteristic of the southern coast division from Swellendam to Uitenhage. The difficulty in coming to a decision on this point is, however, enhanced by the difficulty in ascertaining which of the several dwarf species met with in the Cape Peninsula is being mentally pictured by a South African

botanist when the contrast in question is made. As to this latter problem, the difficulty is nowhere better stated than it has been by the late Professor Harvey in a half-pathetic note on a sheet of *C. africana* of his own collecting :—" If there be two there are half a dozen species of Cluytia here. A very variable plant or group." The writer is satisfied that Burchell's " *C. myrtifolia* " is very distinct from and should never have been confounded with *C. africana*, or *C. rubricaulis*, or *C. laxa*, or *C. pterogona*, and it would not surprise him greatly to learn that *C. myrtifolia*, Burch., is equally distinct from the true *C. Alaternoides*. But apart from their great difference in size, the distinguishing features elude him, and it must be left to South African botanists to say whether the judgment formed by Burchell in the field is really so little deserving of consideration as the action taken by Meyer, Sonder, Müller and Pax would suggest.

15. **Cluytia imbricata**, *E. Mey. in Drège, Zwei Pfl. Documente*, 174, *quoad* a *tantum* [nomen] (1843) ; fruticulus erectus, 60 cm. altus ; caules graciliores lignosi, valde intricatim ramosi ; ramuli glabri ; folia sessilia, dense imbricata, coriacea, opaca, obovato-oblonga, obtusa apice minutissime mucronulata, versus basin gradatim attenuata, margine minutissime scabrida, parum revoluta, 5 mm. longa, 2 mm. lata, utrinque glaberrima, glauca ; internodia teretia, brevissima ; flores dioici, albi, pedicellati, maris in glomerulas paucifloras dispositi, feminei solitarii ; pedicelli glabri ; sepala maris obovata, obtusa, glandula basali 3-loba aucta ; petala late obovata, cuneatim unguiculata, basi 2-glandulosa ; ovarii rudimentum turbinatum, glabrum ; sepala feminei elliptico-lanceolata, glandula basali 3-loba aucta ; petala oblongo-obovata, eglandulosa ; ovarium glabrum ; styli liberi, 2-fidi ; capsula subglobosa, 4 mm. lata ; semina nigra, nitentia. *Sond. in Linnaea*, xxiii. 125 [nomen] (1850) ; *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 83 [nomen] (1911).

Western Region : Little Namaqualand ; Khamiesberg, between Pedro's Kloof and Leliefontein, *Drège*, a ; 3030 ; near the summit of Beacon Hill, *Pearson*, 6710 partly ; near stream in Groene Kloof, *Pearson*, 6617.

Sonder has suggested that this species, which has never been properly described, may be only a form of *C. brevifolia*, Sond. This is not the case ; *C. brevifolia* is nearly allied to *C. polifolia* and has by Müller been treated as a variety of *C. polifolia*, whereas *C. imbricata*, as E. Meyer himself has indicated, is so nearly allied to *C. rubricaulis*, Eckl., that one form of the latter was issued by Meyer as *C. imbricata*, b. To Baillon (Adansonia, iii. 153) the suggestion of Sonder appeared so satisfactory that he actually reduced *C. imbricata* to *C. brevifolia*. It is not convenient to follow Baillon in this action because *C. brevifolia* is one of the forms with stomata on the under side of the leaf only, whereas both of the plants issued by E. Meyer as *C. imbricata* have stomata on both sides of their leaves. The main difference between the two plants issued by E. Meyer as *C. imbricata*, a and *C. imbricata*, b respectively, lies in the fact that the leaf-edges in ' a ' are revolute, in ' b ' are quite flat. But it has to be kept in mind that these two plants issued as ' a ' and ' b ' were both collected by Drège at the same time and in the

same place, and it has further to be noted that in another locality in the same region, Professor Pearson, an equally careful collector, has, as his n. 6710, issued the very same combination. It is therefore a matter for attention by field-botanists in South Africa as to whether after all Drège and Pearson may not be fully justified in considering the two plants conspecific. If it should be found that E. Meyer was right in accepting Drège's judgment, and that Sonder was wrong in doubting it, the question will arise as to whether one of the plants here included in *C. rubricaulis* var. *tenuifolia* had not better be transferred to *C. imbricata*.

16. **Cluytia rubricaulis**, *Eckl. ex Sond. in Linnaea*, xxiii. 128 (1850); fruticulus erectus ad 60 cm. usque altus ; caules rigidi, lignosi, satis copiose ramosus ; ramuli ascendentes, glabri ; folia sessilia, dense imbricata, coriacea, opaca, oblongo-ovata. obtusa apice mucronulata, basi rotundata vel late cuneata, margine scabrida, plana, 1·2 cm. longa, 5 mm. lata, utrinque glaberrima, glauca ; internodia teretia, brevissima ; flores dioici, albi, pedicellati, maris in glomerulas paucifloras dispositi, feminei solitarii, pedicelli glabri, maris graciles 4 mm. longi, feminei fructigeri rigidi, crassiores, 5–6 mm. longi ; sepala maris obovata, obtusa, glandula basali 3-loba aucta ; petala late obovata, cuneatim unguiculata, basi 2-glandulosa ; ovarii rudimentum turbinatum, glabrum ; sepala feminei elliptico-lanceolata, glandula basali 3-loba aucta ; petala oblongo-lanceolata, eglandulosa ; ovarium glabrum ; styli liberi, 2-fidi ; capsula subglobosa, 4 mm. lata ; semina nigra, nitentia. C. Alaternoides β [brevifolia], *E. Mey. in Drège, Zwei Pfl. Documente*, 174, *quoad* c, d, e, f, *et* g (1843) ; *nec* C. alaternoides, β brevifolia, *E. Mey. ex Sond.* C. polygonoides, *Krauss in Flora*, xxviii. 82 (1845) ; *nec Linn. nec Thunb., vix Willd. vix Sond.* C. polygonoides, β foliis utrinque glaucis, *Sond.* l.c. (1850). C. Alaternoides, δ microphylla, *Müll. Arg. in DC. Prodr.* xv. 2, 1048 *partim et quoad syn. Eckl. tantum* (1866) ; *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 70, *partim et quoad* f. 2 glauca *tantum* (1911). C. glauca, *Pax in Ann. Hofmus. Wien.* xv. 50 (1900).

Coast Region : Clanwilliam Div. ; Wupperthal, *Wurmberg* (*Drège* β, letter e). Piquetberg Div. ; Oliphants River Mountains behind Warm Baths, *Phillips*, 7253. Tulbagh Div. ; New Kloof near Tulbagh, *Burchell*, 1016 ; Winterhoek Mountains, *Bolus*, 5356 ; Saron, 300 m., *Schlechter*. Worcester Div. ; above Worcester, *Rehmann*, 2538 in part. Paarl Div. ; Drakenstein Mountains, 900–1200 m., *Drège* β, letter c. Cape Div. ; Table Mountain, *Ecklon*, *Krebs*, *Prior* ; Cape Flats, *Bergius*, *Sparrmann*, *Ecklon*, 416 ;Devil's Peak, *Harvey* ; between Paarden Island, Blueberg and Tygerberg, *Drège* β, letter d. Stellenbosch Div. ; Stellenbosch, *Prior* ; Hottentots Holland Mountain, 300 m., *Diels*, 1310. Caledon Div. ; Baviaan's Kloof, near Genadendal, *Drège* β, letter f ; *Ecklon* ; Houw Hoek, *Bolus*, 9937 in part : near Greitjesgat, *Ecklon*. Riversdale Div. ; Albertina, *Muir*. Mossel Bay Div. ; Attarquai Kloof, *Gill*. George Div. ; near George, 300 m., *Burchell*, 6007 ; *Bowie* ; *Drège* β, letter g ; *Penther*, 1597 ; *Schlechter*, 2240. Humansdorp Div. ; near Humansdorp, *Rogers*, 2907 in part ; 2934 ; 2994. Port Elizabeth Div. ; near Port Elizabeth, *Ecklon & Zeyher* ; *Ecklon*, 977 ; *Mrs. Paterson*, 1109, 2135 ; *Drège fil.*, 414 !

Var. β. **microphylla**, *Müll. Arg.* [*sub* Alaternoides] *in DC. Prodr.* xv. 2, 1048 (1866); suffrutex prostratus, fastigiatim intricatimque ramosus; folia typi nisi multo minora, 3–6 mm. longa, 2·5–3 mm. lata. *Pax* [*sub* Alaternoides] *in Engl. Pflanzenr.* l.c. *fig.* 22 C *et quoad* f. 1, typica *tantum* (1911). C. Alaternoides β [brevifolia], *E. Mey. in Drège* l.c., *quoad* b *tantum* (1843); *nec* β brevifolia, *E. Mey. ex Sond.* C. polygonoides, *Sond.* l.c. (1850); *Baill. Adansonia*, iii. 153, *excl. syn. Willd. et syn. Burm.* (1862); *nequaquam Linn., vix Willd. vix Krauss.* C. gnidioides, *Willd. MSS. in Herb. Berol.* C. microphylla, *Burch. MSS. in Herb. Kew.* C. polygonoides, *var.* curvata, *E. Mey. MSS. in Herb. Lubeck.*

Coast Region: Malmesbury Div.; Hopefield, *Bachmann*, 115, 943. Worcester Div.; Dutoits Kloof, 600–1200 m., *Drège* β, letter b; above Worcester, *Rehmann*, 2538 in part. Stellenbosch Div.; Hottentots Holland Mountains, 300 m., *Zeyher*, 3831; *Prior.* Caledon Div.; near Genadendal, *Burchell*, 8625; Baviaan's Kloof, *Burchell*, 7667; Houw Hoek Mountains, *Burchell*, 8151; *Scott Elliot*, 1115; near Greitjesgat, 600–1200 m., *Ecklon*, 52 in part; without precise locality, *Lichtenstein*; *Miss Cole.*

Var. γ, **grandifolia**, *Krauss* [*sub* polygonoides] *in Flora*, xxviii. 82 (1845); fruticulus erectus, parce ramosus ramulis ascendentibus, vel subsimplex; folia obovata versus basin cuneatim attenuata, 2–3 cm. longa, 8–10 mm. lata. C. Alaternoides, *Thunb. Prodr. Pl. Cap.* 53 (1794) et *Fl. Cap. ed. Schult.* 470, *partim* (1823); *E. Mey. in Drège* l.c. 174, *quoad* b *tantum* (1843); *nec Linn.* C. polygonoides, *Willd. Hort. Berol.* 51, t. 51 (ante 1805), et *Sp. Pl.* iv. 2, 879 (1805); *Pers. Synops.* iii. 49 (1807); *Ait. Hort. Kew*, ed. 2, v. 422 (1813); *Dietr. Synops.* v. 455 (1852); *Baill. Adansonia*, iii. 153, *quoad syn. Willd. tantum* (1862); *nec Linn.* C. Alaternoides, γ genuina, *Müll. Arg.* l.c. *quoad* b, oblongata *et* d, elliptica *tantum* (1866); Pax l.c. 68 *quoad* 1, grandifolia *tantum* (1911).

Coast Region: Clanwilliam Div.; Cedarberg, 900 m., *Diels*, 870. Cape Div.; numerous localities, *Tulbagh*, 127 *in hb. Linn.*; *Bergius*; *Lalande*; *Sieber*, 148; *Forbes*; *Dubuc*; *Miss Cole*; *Boivin*, 733; *Krebs*, 103; *Lichtenstein*; *Burchell*, 260 in part; *Spielhaus*; *Rehmann*, 974, 1271 partly; *Ecklon*, 603; *Zeyher*, 3822; *Drège*, b, 138; *Schlechter*, 710, 977; *Fuller*; *Diels*, 110; *Wolley Dod*, 1209; *Wilms*, 3613, 3614, 3615; *Rogers*, 11,222. Caledon Div.; Caledon, *Ecklon.* 449. Mossel Bay Div.; Attarquai Kloof, *Gill.* Humansdorp Div.; Kruisfontein Mountain, 240 m., *Galpin*, 4592.

Var. δ, **tenuifolia**, *Prain*; suffrutex erectus vel prostratus, fastigiatim intricatimque ramosus; folia lanceolato-linearia vel linearia raro anguste ovato-lanceolata vel obovato-lanceolata, acuta, basi cuneata margineque versus basin nonnunquam subinvoluta, 6–18 mm. longa, 2–3 mm. lata. C. imbricata, *E. Mey. in Drège, Zwei Pfl. Documente*, 174, *partim et quoad* b (mas) *tantum* (1843); *nec E. Mey. ex Sond.* l.c. 125. C. tenuifolia, *Sond.* l.c. 123 (1850); *nequaquam Willd.* C. Alaternoides, ε angustifolia, b brachyphylla, *Müll. Arg.* l.c. (1866). C. Alaternoides, γ angustifolia, f. 2 brachyphylla, *Pax* l.c. *partim* (1911). C. thymifolia, *Willd. MSS. in herb. Berol.*

Coast Region: Van Rhynsdorp Div.; Giftberg, 300–600 m., *Phillips*, 7387, 7395. Clanwilliam Div.; Cedarberg, Kana Kadouw

Pass, 1170 m., *Diels*, 928. Piquetberg Div.; Mount Cango, *Mund & Maire*. Malmesbury Div.; near Hopefield, *Bachmann*, 944; between Hopefield and Langebaan, *Bachmann*, 2079, 2080; *Bolus*. Tulbagh Div.; near Tulbagh Waterfall, *Ecklon & Zeyher*. Cape Div.; without precise locality, *Tulbagh*, 113 *in herb Linn.*; *Lichtenstein*. Stellenbosch Div.; Lowry's Pass, 150 m., *Schlechter*, 1191. Caledon Div.; Klein Rivier Mountains, 300–900 m., *Ecklon & Zeyher*, 64; near Caledon, *Bolus*, 8501. Swellendam Div.; without precise locality, *Mund & Maire*. Riversdale Div.; without precise locality, *Rust*, 550. Mossel Bay Div.; Little Brak River, *Rogers*, 4213.

Central Region: Ceres Div.; slopes at Hottentots Kloof, *Pearson*, 4897. Prince Albert Div.; Zwarteberg Pass, 1500 m., *Bolus*, 12,288.

Western Region: Little Namaqualand; Khamiesberg, between Pedro's Kloof and Leliefontien, *Drège* (*C. imbricata*, b); near the summit of Beacon Hill, *Pearson*, 6710, partly.

An examination of the literary history of the species here described as *C. rubricaulis*, Eckl., a name already indirectly established by Sonder in 1850, shows that although both Linnaeus and Thunberg included it in *C. Alaternoides*, this error was avoided by their successors from Willdenow onwards. During the sixty years when this more natural view prevailed the authors who held it were misled in their supposition that this species was the plant intended by Linnaeus as *C. polygonoides*, a circumstance due no doubt to none of them having had an opportunity of seeing what the *C. polygonoides* of Linnaeus and Willdenow really is. The adoption by Müller in 1866 of the older and manifestly erroneous view of Linnaeus and Thunberg, in preference to the more matured and more natural view of Willdenow, Krauss and Sonder, was a somewhat unfortunate reversion.

In recognising a variety *microphylla* as apart from typical *rubricaulis* we have followed Sonder, and have done so more for the sake of simplifying the synonymy than because there is any real necessity for the establishment of this variety. The specimens of Ecklon show that although Sonder has limited the name *C. rubricaulis*, Eckl., to the larger leaved plant subsequently described by Pax as *C. glauca*, Ecklon really intended his name to include both what is here termed var. *microphylla* and typical *rubricaulis*. The same is true of the name *C. gnidioides*, which Willdenow proposed, but unfortunately never published, and the same is true of the name *C. microphylla*, which Burchell proposed for his n. 8151, and which Müller took up in a varietal sense under *C. Alaternoides*. The same is also true of the name *C. polygonoides* as employed by Krauss in 1843. A study of the localities whence the two forms here treated as typical *rubricaulis* and as var. *microphylla* respectively have been reported, strongly suggests that the view held by Willdenow, Burchell, Krauss and Müller is preferable to that adopted by Sonder, and that the plant here termed var. *microphylla* is merely a stunted condition of typical *rubricaulis*, not a distinct variety.

As regards var. *grandifolia* matters are different. The plant so named here is the plant which Willdenow mistook for *C. polygonoides*. When he used for what is only a form of typical *C. rubricaulis* the name *C. gnidioides*, he therefore suggested that it and what Krauss has treated as a variety of *C. polygonoides* must be specifically distinct. We have followed Krauss in thinking that after all the two are but varieties of one species, but there is no doubt that they are valid varieties. It should be noted that while Willdenow supposed the larger leafed variety to be *C. polygonoides*, Krauss supposed—equally erroneously, it is true—that the smaller leafed plant deserved that name.

The remaining variety, here termed *tenuifolia*, may, as the result of further field-study, prove to be specifically distinct from *C. rubricaulis*. It includes three quite readily distinguishable forms : (*a*) with long, narrow, linear leaves subinvolute towards the base = *C. tenuifolia*, Sond. non Willd. ; (*b*) with linear-lanceolate leaves subinvolute towards the base = *C. thymifolia*, Willd. MSS. ; and (*c*) with short ovate-lanceolate leaves quite flat along the margin throughout = *C. imbricata*, E. Mey., b *not* a. This last differs mainly from the true *C. imbricata*, E. Mey., a *not* b, in having flat leaf-margins, the leaf-margins of *C. imbricata* being revolute.

17. **Cluytia ovalis**, *Sond. in Linnaea*, xxiii. 129 (1850) ; *Baill. Adansonia*, iii. 153 (1862) ; *Müll. Arg. in DC. Prodr.* xv. 2, 1047 (1866) ; *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 71 (1866). C. Alaternoides, β genuina, f. 3 elliptica, *Pax* l.c. 70, *partim* (1911); *nec Müll. Arg.*

Coast Region : Piquetberg and Tulbagh Divs.

As this form is so far known only in one sex we have followed Sonder, Müller and Pax in maintaining it as a distinct species. It may, however, prove on further field study that this is only a variety of *C. rubricaulis* differing from the type of that species in having internodes as long as, in place of much shorter than the leaves ; or that it is only a variety of *C. africana* with much smaller leaves quite flat at the margin. Which of the two positions may prove the more satisfactory it is, with the material at our disposal, as yet impossible to say. Baillon in 1862 hazarded the suggestion that *C. ovalis* may not be a *Cluytia* at all ; for this guess there is no justification. The original type of the species is in herb. Holm. ; it matches exactly 'Schlechter 4966' which Pax has placed in *C. Alaternoides β genuina*, and identified with Müller's form *elliptica*—a plant which *C. ovalis*, Sond., does not closely resemble or readily recall.

¶ 4. **Impeditae**, *Prain*.—Folia haud ericoidea, membranacea, glabra, sessilia, pellucido-punctata, margine plana.—Species 1 ; *C. impedita.*

18. **Cluytia impedita**, *Prain* ; suffrutex, caules rigidi, erecti, versus apicem copiose virgatim ramosi, 45–60 cm. alti, tereti, glaberrimi ; folia brevissime petiolata, firmiter papyracea, densius imbricata, obovata apice truncata vel retusa, basi gradatim cuneata, margine plana, 8–12 mm. longa, versus apicem 6–8 mm. lata, pallide viridia, glabra, pellucido-punctata, verrucosa, costa inconspicua ; petiolus 1–2 mm. longus ; flores dioici maris tantum adhuc noti, solitarii vel

2-ni, punicei ; pedicelli perbreves, 1 mm. longi ; sepala maris suborbicularia, subcarnosa, glandula basali 2–4-loba aucta ; petala obovata, sensim versus basin angustata ibique glandula minutissima aucta ; ovarii rudimentum ovoideum, glabrum.

Coast Region : Queenstown Div. ; Andriesberg, near Bailey, 1900 m., *Galpin*, 2026. Cathcart Div. ; Bontebok Flats, *Sim*, 2543. Without locality, *Prior*.

A very distinct species, not particularly closely related to any other in the genus.

¶ 5. **Alpinae**, *Prain*.—Folia haud ericoidea, membranacea, parce pubescentia, petiolata, pellucido-punctata, margine parum revoluta ; glandulae maris omnes in fundo calycis sitae.—Species 1 ; *C. alpina*.

19. **Cluytia alpina**, *Prain* ; suffrutex, caules numerosi e rhizomate lignoso prostrati, 10–30 cm. longi, ramulos plures 5–15 cm. longos prostratos vel ascendentes emittentes ; ramuli angulati vel subalati, parce molliter cinereo-tomentosi ; folia petiolata, membranacea, pellucido-punctata, ovata, obtusa, basi rotundata vel truncata, margine revoluta, 8–12 mm. longa, 5–8 mm. lata, supra secus costam adpresse hirsuta ceterum utrinque glabra, nervi inconspicui ; petioli 3–4 mm. longi, pubescentes ; flores dioici, virides, maris tantum noti, in axillis 2-ni ; pedicelli brevissimi basi perulis minimis ovatis hyalinis margine versus basin ciliatis cincti ; sepala maris ovata, obtusa, intus eglandulosa ; petala spathulata, eglandulosa sed quot petala totidem glandulae in fundo calycis intra petalorum insertionem innatae reperiuntur ; ovarii rudimentum cylindricum, glabrum.

Central Region : Barkly East Div. ; Wittebergen, on Ben Macdhui, 2800 m., *Galpin*, 6827.

A very distinct species, not particularly nearly allied to any other in the genus.

¶ 6. **Pulchellae**, *Prain*.—Folia haud ericoidea, membranacea, parcius pubescentia vel glabrescentia, petiolata, pellucido-punctata vel raro (*C. affinis*) opaca, margine plana. *Paucіglandulosae*, Pax et K. Hoffm. in Engl. Pflanzenr.—Euphorb. Cluyt. 53, sensu strictiore (1911).—Species 5 ; *C. glabrescens*, *C. Galpini*, *C. pulchella*, *C. mollis*, *C. affinis*.

20. **Cluytia glabrescens**, *Knauf in Engl. Bot. Jahrb.* xxx. 340 (1901). C. abyssinica, *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 57, *partim* (1911) ; *Hutchinson in Dyer*, *Fl. Trop. Afr.* vi. 1, 807, *partim* (1912) ; *nec Jaub. et Spach.*

Eastern Region : Zululand.

Also in Nyasaland.

The Zululand specimens of this species agree exactly with those collected on Mount Chiradzulu in Nyasaland, and with the original specimens on which *C. glabrescens*, Knauf, was based. There is no doubt that the species, which has, by Pax and also by Hutchinson, been reduced to *C. abyssinica*, Jaub. & Spach, is very nearly related to that plant, but they are so very readily distinguished that it is more convenient to adopt Knauf's view.

21. **Cluytia Galpini**, *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 54 [*sub* C. pulchella] (1911) ; frutex, 1–1·5-metralis ; ramuli laeves,

juniores puberuli; folia distincte petiolata, firmiter membranacea, pellucido-punctata nec tamen verrucosa, ovata, acuta, 2·5 cm. longa, 1·2–1·8 cm. lata, juniora subtus puberula, mox glabra, pallide viridia; petioli 5–6 mm. longi; flores dioici, albi, maris in glomerulas pauciflоras aggregati, feminei saepius singuli, raro 3-ni; pedicelli breves, feminei fructigeri elongati 4–5 mm. longi; sepala maris oblongo-ovata, haud verrucosa, glandula basali 3-loba aucta: petala deltoideo-ovata, in ungem latiorem angustata, basi 1-glandulosa; ovarii rudimentum sursum dilatata, glabra; sepala feminei eis maris similia nisi firmiora; petala maris nisi glandula multo minore vel omnino deficiente; ovarium glabrum; styli liberi, breviter 2-fidi; capsula 5 mm. lata, subglobosa, verrucoso-punctata; semina nigra, nitentia. *Pax in Bull. Herb. Boiss.* vi. 736, *quoad nomen sed descr. maris et spp. Galpin* 961 *exclus.* (1898). C. pulchella, γ ovalis, *Müll. Arg. in DC. Prodr.* xv. 2, 1046 (1866); *Pax in Engl. Pflanzenr.* l.c. 55 (1911). C. pulchella, f. genuina, *Pax* l.c. 54, *pro parte* (1911); *nequaquam* C. pulchella, *Linn.*

Kalahari Region: Transvaal; Pretoria and neighbourhood, *Rehmann*, 4231, 4287; *Leendertz.* 532; *Bolus*, 10839. *Wilms*, 1320 partly; *Kirk fil.*, 50; *Burtt Davy*, 7477; Wonderboompoort, *Rehmann*, 4589; Heidelberg, *Leendertz*, 1031; Boschveld, *Rehmann*, 4871; Elandsfontein near Johannesburg, 1700 m., *Gilfillan in herb. Galpin*, 1426; Rustenburg, 1400 m., *Miss O. Nation*, 52, 202; Barberton, 900 m., *Thorncroft*, 1943; without precise locality, *Wahlberg.*

Cluytia Galpini is very closely allied to *C. Whytei*, Hutchinson (Fl. Trop. Afr. vi. 1, 806) a small Nyasaland tree with much stouter branches and twigs. Among South African species it is most nearly allied to *C. pulchella*, Linn., whereof it was considered a variety by Müller in 1886, and to which it was reduced without comment by Pax in 1911. In 1898 the gathering from Boschveld cited above (*Rehmann*, 4871) was placed by Pax alongside a gathering from Barberton (*Galpin*, 961), the two being treated conjointly as the basis of a distinct species, *Cluytia Galpini*, Pax. The description of the male flowers, taken from Galpin's plant, shows that that plant is not a *Cluytia* at all, but that it is, as Pax has since pointed out (*Pflanzenr.* l.c. 83), an *Andrachne, A. ovalis.* But when correcting this misapprehension Pax created another one by transferring Rehmann's plant, which really is a *Cluytia*, not to *C. pulchella*, γ *ovalis*, Müll. Arg., which it exactly matches, but to the true *C. pulchella* from which it differs so greatly as to deserve specific rank. The name *C. Galpini*, as employed in 1898, applied only partly to this species; as used in 1911 it has, in one passage, been restricted entirely to this species. Seeing that the species has no earlier available name—that of *ovalis*, used for it in a varietal sense in 1866 by Müller, is precluded owing to the existence of another *ovalis* established in 1850 by Sonder—it is possible now to employ the name *Galpini* as restricted by Pax in 1911, though it is at the same time necessary to furnish an adequate description.

22. **Cluytia pulchella**, *Linn. Sp. Pl.* 1042 [Clutia] (1753) et *ibid. ed.* 2, 1475 (1763); *Burm. f. Prodr.* 27 bis [31] (1768); *Lamk, Encyc. Meth.* ii. 54 (1786); *Ait. Hort. Kew.* iii. 420 (1789); *Thunb. Prodr. Pl. Cap.* 53 (1794); *Willd. Sp. Pl.* iv. 2, 881 (1805); *Pers.*

Synops. ii. 636 (1807); *Ait. Hort. Kew.* ed. 2, v. 423 (1813); *Curtis Bot. Mag.* xlv. t. 1945 (1818); *Thunb. Fl. Cap. ed. Schult.* 271 (1823); *A. Juss. Euphorb. Gen. Tent.* t. 6, fig. 21 (1824); *Spreng. Syst.* iii. 49 (1826); *E. Mey. in Drège, Zwei Pfl. Documente*, 174, *quoad* a *tantum* (1843); *Krauss in Flora*, xxviii. 81 (1845); *Sond. in Linnaea*, xxiii. 129 (1850); *Dietr. Synops.* v. 455 (1852); *Baill. Étud. gén. Euphorb.* t. 16, fig. 6–19 (1858) et *in Adansonia*, iii. 153 (1862); *O. Kuntze, Rev. Gen. Pl.* iii. 2, 284, (1898). C. cotinifolia, *Salisb. Prodr.* 390 (1796). C. pulchella, *α* genuina, *Müll. Arg. in DC. Prodr.* xv. 2, 1045 (1866) *et* β obtusata, *Müll. Arg.* l.c. 1046, *partim* (1866). C. pulchella, f. genuina (*syn.* C. Galpini *et spp. omnia transvaalens. excl.*), f. macrophylla (*syn. Müll. Arg. excl.*) *et* f. obtusata (*pro parte tantum*), *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 54 (1911).

Coast Region: Cape, George, Knysna, Humansdorp, Albany and Bedford Divs.

Eastern Region: Pondoland and Natal.

Var. β **obtusata**, *Sond.* l.c. (1850); *Müll. Arg.* l.c. 1046, *pro parte maxima* (1066). C. pulchella, *E. Mey. in Drège* l.c., *quoad* b *tantum* (1843). C. microphylla, *Pax in Ann. Hofmus. Wien.* xv. 49 (1900). C. pulchella, f. genuina (*quoad Rehmann* 5912 *tantum*), f. microphylla, f. macrophylla (*quoad spp. natalens. tantum*) *et* f. obtusata (*pro parte maxima*), *Pax* l.c. (1911).

Coast Region: Uitenhage, Albany, Alexandria, Bathurst, Stockenstroom, Queenstown, and King Williamstown Divs. and in British Kaffrania.

Central Region: Somerset and Tarka Divs.

Kalahari Region: Orange River Colony, Basutoland and Transvaal.

Eastern Region: Transkei, Tembuland, Pondoland, Griqualand East and Natal.

Var. γ, **Franksiae**, *Prain*; ramuli nec verrucosi, persistenter pilis patentibus mollibus pilosi; folia tenuiter membranacea, punctata nec tamen verrucosa, ovata, subacuta, 2–2·5 cm. longa, 1·2–1·8 cm. lata, nervis supra pilosis exceptis glabra, subtus persistenter pilis patentibus mollibus hirsuta.

Eastern Region: Natal; Amazimtoti, *Miss Franks in herb. Wood*, 11,912.

This familiar plant, which has been in cultivation in Europe since the end of the seventeenth century, is one of the best known of South African species of Euphorbiaceae. It occurs in two readily separable forms which were for the first time recognised in 1850 by Sonder, and were by him treated as two distinct varieties characterised by the different shape of their leaves. This difference in form of leaf, though general, is not by any means constant, and owing to their having overlooked this fact both Müller in 1866 and Pax in 1911, while recognising the existence of Sonder's β *obtusata* have marred its natural character. They have included in it specimens which, though they have obtuse leaves, really belong to *C. pulchella* proper and they have excluded from it specimens which really belong to β *obtusata* but which do not happen to have blunt-tipped leaves.

The distinction between *C. pulchella* proper and β *obtusata*, Sond., does not depend upon the form of the leaf-blade, which may be obtuse or acute in either variety, but upon the absence from β *obtusata* of the minute warts which characterise the twigs, petioles and leaves of *C. pulchella* proper. So different are these two plants that in 1900 Pax based upon what is only a condition of β *obtusata*, Sond., a distinct species which he named *C.microphylla* ; it is within the bounds of possibility that further field study on the part of South African botanists may show that Pax's action in 1900 was fully warranted. The form *macrophylla*, which, as limited by Müller in 1866, belongs to *C. pulchella* proper and, as limited by Pax in 1911, belongs equally to the type and to β *obtusata*, has no actual existence and must be eliminated. In 1866 Müller added a third variety, γ *ovalis*, which, now that more ample material is available, proves to be a distinct and valid species.

We now find it necessary to add in turn a new variety, γ *Franksiae*, which agrees with β *obtusata* in the absence of verrucosity and from both β *obtusata* and true *C. pulchella* in the character of its indumentum. But the position allocated to this plant is tentative only ; it is as yet incompletely known and it is by no means improbable that, when more fully represented, it too will be found to be a distinct species.

23. **Cluytia mollis**, *Pax in Engl. Bot. Jahrb.* xix. 112 (1894) et *in Engl. Pflanzenr.—Euphorb. Cluyt.* 55 (1911) ; *Hutchinson in Dyer Fl. Trop. Afr.* vi. 1, 808 (1912). C. leuconeura, *Pax in Engl. Bot. Jahrb.* l.c. (1894) ; *fide Pax.* C. abyssinica, δ usambarica, *Pax et K. Hoffm. in Engl. Pflanzenr.* l.c. 57 (1911) *et* ε ovalifolia, *Pax et K. Hoffm.* l.c. (1911) ; *fide Hutchinson.*

Eastern Region : Natal ; Alfred County.

Also in Tropical East Africa.

Very nearly allied to *C. pulchella*, Linn., but with leaves much larger than in that species, densely persistently velvety on the nerves beneath.

24. **Cluytia affinis**, *Sond. in Linnaea*, xxiii. 126 (1850) ; *Müll. Arg. in DC. Prodr.* xv. 2, 1050, *var.* β *inclus.* (1866) ; *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 76, *var.* β *inclus.* (1911). C. hirsuta, *Eckl. et Zeyh. ex Sond.* l.c. (1850) ; *nec E. Mey.* C. pubescens, *Eckl. et Zeyh. partim, ex Sond.* l.c. (1850) ; *nec Thunb., nec Willd.* C. phyllanthifolia, *Baill. Adansonia*, iii. 153 (1862). C. retusa, *Thunb. MSS. in herb. Thunb. propr.* ; *nec Linn.*

Coast Region : Stellenbosch, Swellendam, George, Humansdorp, Uitenhage, Port Elizabeth, Albany, Bedford, Stockenstroom, Queenstown, King Williamstown, East London and Komgha Divs., and in British Kaffraria.

Kalahari Region : Transvaal ; Pietersburg and Lydenburg Dists.

Eastern Region : Transkei ; Natal (Alexandra County), and Zululand.

A very distinct species, known first to Thunberg who supposed it to be possibly the *C. retusa* of Linnaeus—an Indian plant not now included in *Cluytia*. Like many other species of *Cluytia*, *C. affinis* has the leaves on its lateral (floriferous) twigs rather different in appearance from those on its stems and main-branches.

Baillon, like Sonder, recognised the claim of this plant to specific rank, but, not having seen an authentic specimen of *C. affinis*, supposed Sonder's plant to be the same thing as *C. hirsuta*, E. Mey., and did not discover that, as *C. phyllanthifolia*, Baill., he was only redescribing *C. affinis*, Sond. It so happens that *C. phyllanthifolia* was based on lateral twigs only, whereas Sonder's account of *C. affinis* was based on complete material. As a consequence the variety β *phyllanthifolia*, Müll. Arg. l.c. 1051 (Drège 8226 a et 8226 c nec tamen 8226 b) has no real existence.

§ II. Multiglandulosae, *Pax et K. Hoffm. in Engl. Pflanzenr.—Euphorb. Cluyt.* 59 (1911) *ampl.*—Petala maris singula glandulis 3–10 munita; glandulae rarissimé petalorum ungui adnatae, saepissime a petalo liberae et in fundo calycis sitae.

¶ 7. **Myricoideae**, *Prain.*—Folia haud ericoidea, membranacea, parcius pubescentia vel glabrescentia, petiolata, pellucido-punctata, margine plana. *Multiglandulosae*, Pax et K. Hoffm. l.c., sensu strictiore (1911).—Species austro-africana 1; *C. natalensis.*

25. **Cluytia natalensis**, *Bernh. ex Krauss in Flora*, xxviii. 81 (1845); *Sond. in Linnaea*, xxiii. 127, *var.* β *inclus.* (1850); *Baill. Adansonia*, iii. 150, *var.* β *inclus.* (1862); *Müll. Arg. in DC. Prodr.* xv. 2, 1052, *var.* β *inclus.* (1866); *O. Kuntze, Rev. Gen. Pl.* iii. 2, 284 (1898); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 64, *var.* β *inclus.* (1911). Cluytia nn. 8225, 8226 b [*nec* a], *E. Mey. in Drège, Zwei Pfl. Documente*, 174 (1843).

Coast Region: Alexandria, Albany and Queenstown Divs.

Central Region: Tarka and Aliwal North Divs.

Kalahari Region: Orange River Colony, Basutoland, and Transvaal.

Eastern Region: Tembuland, Griqualand East, Natal and Zululand.

With age the sparse tawny pubescence of *C. natalensis* almost disappears and on an adult specimen (*Zeyher* 1512 from the Caledon River) Souder based a variety *glabrata* which has been accepted by Baillon, Müller and Pax, but which in reality has no existence.

8. **Disceptatae**, *Prain.*—Folia haud ericoidea, membranacea vel papyracea, parcius pubescentia vel glabra, sessilia vel subsessilia, pellucido-punctata, margine parum revoluta, caulibus nunc ramosis nunc e rhizomate lignoso pluribus simplicibus vel vix ramosis. *Simplices*, Pax et K. Hoffm. in Engl. Pflanzenr.—Euphorb. Cluyt. 65 (1911) necnon *Daphnoideae*, Pax et K. Hoffm. l.c., pro parte maxima sed *C. daphnoide*, Lamk, exclus. (1911).—Species 7; *C. platyphylla, C. Dregeana, C. hirsuta, C. disceptata, C. monticola, C. cordata, C. heterophylla.*

26. **Cluytia platyphylla**, *Pax et K. Hoffm. in Engl. Pflanzenr.—Euphorb. Cluyt.* 74 (1911).

Eastern Region: Natal; Alexandra County.

Cluytia platyphylla, known only from a single gathering (Rudatis, 81) and so far only incompletely collected, in foliage most resembles *C. Dregeana*, Scheele, and in male flowers most resembles *C. hirsuta*, E. Mey. For the present, and until this form becomes more fully represented in collections, it seems desirable to accord it the separate recognition claimed for it by its authors.

27. **Cluytia Dregeana**, *Scheele in Linnaea*, xxv. 513 (1852); *Baill. Adansonia*, iii. 153 (1862). C. heterophylla, *Sond. in Linnaea*, xxiii. 128, *pro parte maxima, sed syn. Bernh. et var. β exclus.* (1850); *nequaquam Thunb.* C. Sonderiana, *Müll. Arg. in DC. Prodr.* xv. 2, 1051, *var. amb. inclus.* (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 72, *var. omn. inclus. sed excl. ac Krook* 915 *ac syn.* C. heterophylla, *Pax in Ann. Hofmus. Wien.* (1911). C. similis, *Pax in Engl. Pflanzenr.* l.c. 66, *partim et quoad Bachmann* 750 *tantum* (1911); *nec Müll. Arg.*

Coast Region: Uitenhage, Alexandria and Albany Divs., and in British Kaffraria.

Eastern Region: Transkei and Natal.

Cluytia Dregeana, a very distinct shrubby species, though it is one of those first collected by Drège, was not taken up by E. Meyer in 1843. In 1850, as his specimens show, this species was confused by Sonder with the subherbaceous *C. heterophylla*, Thunb., nor was it duly recognised as the separate species that it is until 1852. Müller in 1866 modified Scheele's treatment of 1852 as the result of his examination of the material in Sonder's herbarium. Into Müller's statement of this result some inadvertence has crept, because he has indicated (DC. Prodr. xv. 2, 1051) that the male and the female specimens of Drège 8229 in that herbarium belong to different species, and has asserted that the ovary in the female specimen of Drège of 8229 is not glabrous. There seems to the writer no justification for the idea that the two specimens in question are other than conspecific; the statement as regards the ovary of the female specimen of Drège 8229 is incorrect. This inadvertence on Müller's part, however, is found on examining Sonder's herbarium not to be due to any error of observation, but to be attributable either to some imperfect register of that observation or to a lapse of memory. For there is still in herb. Sonder the actual female specimen on which the description of *C. Dregeana*, Müll. Arg. l.c., not of Scheele, was based. But this female specimen was not collected by Drège, it does not bear the number 8229, and it was not named either by Scheele or by Sonder. The net outcome of Müller's misreading of labels has been that Müller, who has been followed by subsequent authors, has been led to create for *C. Dregeana*, Scheele, a new and unnecessary homonym *C. Sonderiana*, and has transferred Scheele's name to *C. Krookii*, Pax, a plant that is probably best treated as a variety of *C. hirsuta*, E. Mey. For the recognition of the two varieties proposed by Müller there is no necessity; they represent merely varying states of the same plant.

28. **Cluytia hirsuta**, *E. Mey. in Drège, Zwei Pfl. Documente*, 174 [nomen] (1843) et *ex Sond. in Linnaea*, xxiii. 129 (1850); *Müll. Arg. in DC. Prodr.* xv. 2, 1046 (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 73 (1911). C. heterophylla, β hirsuta, *Sond.* l.c. (1850). C. affinis, *Baill. Adansonia*, iii. 150, *partim et quoad syn. E. Mey. tantum* (1862); *nec Sond.* C. heterophylla, *Pax in Ann. Hofmus. Wien.* xv. 49 (1900); *nec Thunb.* C. Schlechteri, *Pax in Engl. Bot. Jahrb.* xxxiv. 373 (1909). C. hybrida, *Pax et K. Hoffm. in Engl. Pflanzenr.* l.c. 60 (1911). C. Sonderiana, *a* pubescens, *Pax in Engl. Pflanzenr.* l.c. 73, *quoad Krook* 915 *tantum* (1911); *nec Müll. Arg.*

Coast Region : Uitenhage, Albany, King Williamstown and East London Divs.

Central Region ; Somerset Div.

Kalahari Region : Orange River Colony and Transvaal.

Eastern Region : Transkei, Tembuland, Pondoland, Griqualand East and Natal.

Var. β **robusta**, *Prain* ; caules sesquimetrales, quam ei typi manifeste crassiores, saepius minopere ramosi ; folia firmiter papyracea vel subcoriacea, caulina 3·5–4 cm. long, 1·2–1·8 cm. lata, ramealia 1·2–1·8 cm. longa, 6–8 mm. lata. C. Dregeana, *Müll. Arg.* l.c. 1051 (1866) ; *Pax in Engl. Pflanzenr.* l.c. 74 (1911) ; *haudquaquam Scheele.* C. hirsuta, *O. Kuntze, Rev. Gen. Pl.* iii. 2, 284 (1898) ; *vix E. Mey.* C. Krookii, *Pax in Ann. Hofmus. Wien.* xv. 49 (1900) et *in Engl. Pflanzenr.* l.c. 74, *sed syn.* C. Schlechteri, *Pax excl.* (1911).

Coast Region : Uitenhage and Stockenstroom Divs., and in British Kaffraria.

Central Region : Somerset Div.

Eastern Region : Pondoland, Griqualand East and Natal.

Cluytia hirsuta is a distinct shrubby species which in habit most resembles *C. Dregeana*, Scheele, but it is readily distinguished from the latter by its more persistent pubescence, more translucent leaves, longer petioles, shorter male pedicels, pubescent ovary and capsule, and nearly free styles. The female pedicels have been described as being twice as long as the capsules ; this is not the case in *C. hirsuta*, E. Mey., though it happens to be true of *C. disceptata*, the subherbaceous member of the same group of species in which the ovary and the capsules may be hirsute.

The two varieties here recognised correspond precisely with the two species *C. hirsuta* and *C. Dregeana* as these were conceived and defined by Müller. The first of Müller's species included, in addition to *C. hirsuta* as understood and distributed by E. Meyer, another form collected by Wahlberg which is identical with the plant described by Pax as *C. hybrida*, Pax et K. Hoffm. The second of Müller's species, which is altogether different from the original *C. Dregeana*, Scheele, is based upon a specimen identical with the plant subsequently described as *C. Krookii*, Pax. To his own *C. Krookii* Dr. Pax has now reduced his own *C. Schlechteri*, a step for which there is a good deal to be said though, in the writer's opinion, *C. Schlechteri* is really rather a form intermediate between *C. Krookii*, Pax (= C. Dregeana, *Müll. Arg., not of Scheele*) and the original *C. hirsuta*, E. Mey., than one which is strictly referable to either ; if it be nearer to the one than to the other the affinity is closer with *C. hirsuta* than with *C. Krookii*. Under all the circumstances it has appeared preferable to follow Müller's segregation of these forms rather than to adopt the more recent modification thereof independently proposed by Pax. It must, however, be understood that the writer cannot concur with his predecessors in the view that two species, as Müller has said, or three species, as Pax has supposed, are here involved. The recognition of two varieties renders it more easy to follow and disentangle the involved synonymy, but no harm could accrue were our variety *robusta* treated as merely a form equivalent to

"hybrida" or to "Schlechteri" and merged, like them, in Meyer's original species.

28. **Cluytia disceptata,** *Prain*; suffrutex caulibus saepissime simplicibus, raro parce ramosis; caules e rhizomate lignoso plures, erecti, 20–60 cm. alti, sursum minopere angulati, versus basin teretes, juniores parcissime adpresse hirsuti; folia breve petiolata, juniora membranacea, mox papyracea, pellucido-punctata et parcissime verrucosa, ima nonnunquam orbicularia sed saepius ovato-oblonga, superiora ovato-lanceolata raro omnia ovato-lanceolata, acuta, basi lata vel angustius cuneata, margine parum recurva, 1·8–3 cm. longa, 0·8–2·5 cm. lata, viridia, juniora utrinque parce hirsuta, mox glabrescens vel glabra, subtus distincte reticulata; petiolus prope basin 2 mm. longus, superne subobsoletus, pubescens; flores dioici, viridescentes, maris 2–4-ni, feminei solitarii vel nonnunquam 2-ni; pedicelli 8 mm. longi, pubescentes, maris capillacei, feminei rigidi sed gracillimi, fructigeri saepe 1 cm. longi; sepala maris ovato-oblonga, obtusa, punctata nec tamen verrucosa, glandula basali 3–5-loba aucta; petala ovato-rotundata, in unguem latiorem angustata, eglandulosa sed glandulae circiter 25 (pro petalo 4–5) in fundo calycis intra petalorum insertionem innatae reperiuntur; ovarii rudimentum cylindricum, glabrum; sepala feminei oblonga, punctata, glandula basali 2-loba aucta; petala maris vel eglandulosa vel glandula singula basali aucta; ovarium hirsutum; styli basi manifeste connati, sursum 2-fidi; capsula 5 mm. lata, quam pedicellus plus quam duplo breviora, parce setosa vel glabrescens vel glabra, nequaquam verrucosa; semina nigra, nitentia. C. pulchella, *Wood in Wood & Evans, Natal Pl.* i. 68, t. 84 (1899); *nequaquam Linn.* C. heterophylla, *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 66, *partim et quoad syn. Wood* (1911); *nequaquam Thunb.*

Eastern Region: Griqualand East; near Kokstad, 1300 m., *Tyson*, 1114, 1234. Natal; near Durban, *Sanderson*, 661; *Gerrard*, 278; *Gerrard & McKen*; *Wood*, 38, 4944; Inanda, *Wood*, 120; *Rehmann*, 8407; Claremont, *Schlechter*, 2942; Marburg, 90 m., *Rogers*, 536 in part.

This very distinct species has been referred by Medley Wood to *C. pulchella*, Linn., but differs from the latter plant in habit, in its subsessile leaves, in its many petaline glands and in its hirsute ovary. Pax, in rectifying this misapprehension, has referred the plant to *C. heterophylla*. But *C. heterophylla*, Pax is not the true *C. heterophylla*, Thunb., moreover *C. heterophylla*, Pax, not of Thunb., is itself a mixture of two species, one of which is *C. disceptata*, described above, the other being *C. monticola*, S. Moore. This last named plant is readily distinguished from *C. disceptata* by its leaves and stems, which are glabrous at all stages, and by its fruiting pedicels, which are hardly longer than the capsules.

30. **Cluytia monticola,** *S. Moore in Journ. Linn. Soc. Bot.* xl. 197 (1911); *Hutchinson in Dyer, Fl. Trop. Afr.* vi. 1, 803 (1912). C. heterophylla, *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 66, *partim et quoad syn. Schinz* (1911); *nequaquam Thunb.* Middelbergia transvaalensis, *Schinz ex Pax* l.c. (1911).

Kalahari Region: Orange Free State and Transvaal.

Eastern Region: Natal and Zululand.

Also in Rhodesia.

A very distinct species, most nearly allied to *C. disceptata* but readily recognised by its glabrous stems and leaves, and its much shorter female pedicels.

31. **Cluytia cordata**, *Bernh. ex Krauss in Flora*, xxviii. 81 (1845); *Müll. Arg. in DC. Prodr.* xv. 2, 1051 (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 65 (1911). C. heterophylla, *Sond. in Linnaea*, xxiii. 128, *quoad syn. Bernh. tantum* (1850); *Baill. Adansonia*, iii. 150, *quoad syn. Bernh. tantum* (1862); *Pax* l.c., *quoad Rehmann* 7475 *tantum* (1911); *nequaquam Thunb.*

Eastern Region: Pondoland, Natal and Zululand.

Cluytia cordata is very nearly allied to *C. heterophylla*, Thunb. but is nevertheless quite easily distinguished therefrom by its larger, less rigid leaves with a less conspicuous reticulate venation beneath.

32. **Cluytia heterophylla**, *Thunb. Prodr. Pl. Cap.* 53 (1794); *Willd. Sp. Pl.* iv. 2, 881 (1805); *Pers. Synops.* ii. 636 (1807); *Poir. Encyc. Meth. Suppl.* ii. 303 (1810); *Thunb. Fl. Cap. ed. Schult.* 271 (1823); *Spreng. Syst.* iii. 49 (1826); *Sond. in Linnaea*, xxiii. 128, *pro parte minima et quoad spp. Zeyher. apud* Barkhausen *lecta, var.* β *hirsuta et syn. Bernh. exclus.* (1850); *Dietr. Synops.* v. 455 (1852); *Baill. Adansonia*, iii. 150, *pro parte et syn. Bernh. exclus.* (1862); *Müll. Arg. in DC. Prodr.* xv. 2, 1046 (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 66, *quoad syn. Thunb., syn. Willd., syn. Müll. Arg., et syn. Scheele, sed spp. omn. exclus.* (1911). C. similis, *Müll. Arg.* l.c. (1866); *O. Kuntze, Rev. Gen. Pl.* iii. 2, 284 (1898); *Pax* l.c., *pro parte maxima sed Bachmann* 750 *exclus.* (1911). C. dumosa, [*Harv. MSS. in sched.*] *Cooper ex Pax* l.c. (1911). Phyllanthus vaccinioides, *Scheele in Linnaea*, xxv. 585 (1852).

Coast Region: Uitenhage, Port Elizabeth, Bathurst, Albany, Fort Beaufort, Queenstown, Cathcart, East London and Komgha Divs.

Eastern Region: Tembuland and Pondoland.

This easily recognisable species was confused by Sonder in 1850 with three others, *C. cordata*, Bernh., *C. Dregeana*, Scheele, and *C. hirsuta*, E. Mey., all of which are equally distinct from it and from each other. By Baillon in 1862 it was confused with two of these, *C. cordata* and *C. hirsuta*, a confusion even more inexplicable than that of Sonder, when regard is had to the fact that in Baillon's opinion *C. heterophylla* was the plant he had himself in 1858 named *C. floribunda*. That plant, by most other writers, has been confused with *C. Alaternoides*; it is, as we now know, *C. africana*, Poir.

Müller in 1866 reverted once more, at least in intention, to the natural limitation of Thunberg and Willdenow and thereby dispelled the confusion created by Sonder and Baillon. But in doing this Müller created a new difficulty by recognising as a distinct species, *C. similis*, Müll. Arg., what is merely a state of *C. heterophylla*, Thunb., with somewhat thinner leaves. He has added to the difficulty by stating that *C. similis* is based upon a Cape specimen contained in "hb. kunth! ex hb. Mus. paris. in hb. berol." There is no such specimen in the Berlin herbarium now, and the writer has been assured that no such specimen can have been there when Müller examined the Berlin material of the genus, but have now disappeared. No doubt "hb. berol." is a *lapsus calami*

for some other important herbarium and the whereabouts of this missing type may yet be ascertained.* This difficulty necessarily leaves a faint shadow of doubt as to what the real *C. similis*, Müll. Arg. may be, more especially since Müller says its leaves are not punctate. Had it not been for this remark difficulty could hardly have been said to exist, for Müller has attached the name *C. similis* to very many specimens in numerous herbaria and the plant so named is, *in every instance*, the species which Thunberg named *C. heterophylla*, a circumstance which involves the further fact that in every instance the leaves of the plant named *C. similis* by Müller himself are pellucid-punctate, Pax has with justice included all the gatherings seen by him that are referable either to *C. similis*, Müll. Arg. with younger and thinner leaves, or to *C. heterophylla*, Thunb., with older and thicker leaves, in a single species. Unfortunately the name Pax has used for the species as a whole is the one proposed by Müller for its thin-leafed state ; the name *C. heterophylla*, which was first applied to the species, Pax has transferred to a mixture of two nearly allied but nevertheless quite distinct species.

¶ 9. **Daphnoideae**, *Prain*.—Folia haud ericoidea, firme membranacea vel coriacea, pubescentia vel glabra, petiolata vel sessilia, opaca, margine plana. *Daphnoideae*, Pax et K. Hoffm. in Engl. Pflanzenr.—Euphorb. Cluyt. 71, pro parte minima et quoad *C. daphnoiden*, Lamk, tantum (1911). *Tomentosae*, Pax et K. Hoffm. l.c. 75, pro parte minima, et quoad *C. Thunbergii*, Sond., tantum (1911). *Alaternoideae*, Pax et K. Hoffm. l.c. 67, pro parte minima et quoad *C. crassifoliam*, Pax, tantum (1911).—Species 4 ; *C. daphnoides*, *C. vaccinioides*, *C. Thunbergii*, *C. crassifolia*.

33. **Cluytia daphnoides**, *Lamk*, *Encyc. Meth.* ii. 54 [Clutia] (1786); *Willd. Hort. Berol.* i. 52, t. 52, *syn. Comm. excl.* (ante 1805), et *Sp. Pl.* iv. 2, 880, *syn. Comm. et syn. Thunb. excl.* (1805) ; *Pers. Synops.* ii. 636, *syn. Thunb. excl.* (1807) ; *Ait. Hort. Kew*, ed 2, v. 422 (1813) ; *Spreng. Syst.* iii. 49, *syn. Thunb. excl.* (1826) ; *Krauss in Flora*, xxviii. 81 (1845) ; *Sond. in Linnaea*, xxiii. 126, *var.* β *inclus.* (1850) ; *Dietr. Synops.* v. 455 (1852) ; *Baill. Adansonia*, iii. 150 [dapnoides] (1862) ; *Müll. Arg. in DC. Prodr.* xv. 2, 1050, *var.* β *inclus. sed var.* γ *ac syn. Poir. excl.* (1866) ; *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 72, *var. amb. inclus. sed syn. Poir. excl.* (1911). C. tomentosa, *Thunb. ex Schult. in Fl. Cap. ed. Schult.* 271, *partim* (1823) ; *nec Linn., vix Thunb. Prodr.* C. pubescens, *Eckl. et Zeyh. pro parte, ex Sond.* l.c. (1850) ; *nec Thunb., nec Willd.* C. pulchella, *Sparrm. ex Sond.* l.c. (1850) ; *nec Linn.* C. hirsuta, *Pax in Ann. Hofmus. Wien.* xv. 49 (1900) ; *nec E. Mey.*, C. cinerea, *Burm. MSS. in herb. Paris.*

Coast Region: Malmesbury, Cape, Stellenbosch, Riversdale, Mossel Bay, George, Humansdorp, Uitenhage, Port Elizabeth, Bathurst, Albany, King Williamstown and Komgha Divs., and in British Kaffraria.

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* A parallel *lapsus* was committed by Müller (l.c. 848) in the case of *Acalypha patens*, stated to be based on a specimen at Stockholm when the collection intended was that at Copenhagen. In that case it was possible to surmise the nature of the error and to have that surmise confirmed ; in the case of *Cluytia similis* only accident can now clear up the difficulty which Müller has created.

Cluytia daphnoides, which was based by Lamarck on a Cape specimen given to him by Sonnerat, is a very distinct species. It is represented in the Linnean herbarium by an unnamed specimen, and in the herbarium of Thunberg by the male plant written up as *C. tomentosa*. Whether the female plant so written up be, as Müller stated in 1866, conspecific with the male one or, as Sonder thought in 1850, the type of a distinct species, will be discussed under *C. Thunbergii*, Sond.; it is enough to point out here that although, if Sonder's view be the more just, *C. tomentosa*, Thunb. (Prodr. Pl. Cap. 53), cannot be reduced to *C. daphnoides*, we must, even if Sonder's view be correct, cite *C. tomentosa*, Thunb. (in Flor. Cap. ed. Schult. 271) as being, at least in part, equivalent to *C. daphnoides*, because the description given includes an account of the male specimen. In the herbarium of Willdenow *C. daphnoides* is represented by a specimen (n. 10594) cultivated at Berlin and figured by Willdenow prior to 1805; this cultivated plant is rather less hairy than the wild one. Sonder in 1850 recognised two corresponding varieties; without justification, for the glabrescent plant of Willdenow is only a condition of the original plant of Lamarck. One disadvantage of Sonder's treatment is his use of a varietal name, β *incana*, for the original type. In 1866 Müller in effect reversed this arrangement by merging β *incana* in the type and recognising a variety β *glabrata*. Even so, however, matters are little improved, since Willdenow's n. 10594, which is not distinguishable from Müller's β *glabrata*, has been incorporated by Müller in his var. *a genuina*. The truth is that there are not two varieties and the names *incana* of Sonder, *glabrata* of Müller, are equally unnecessary. The synonym of Thunberg which Sonder has excluded is not cited in the only work to which Sonder refers; it is cited in the *Species Plantarum* which Sonder does not quote. Sonder was justified in excluding this synonym, but he overlooked the fact that Poiret in 1810 had excluded, with equally good reason, the synonym of Commelin, cited by Willdenow in both of his works. Poiret unfortunately made the converse mistake of thinking *C. daphnoides*, as figured by Willdenow, to be different from *C. daphnoides* as described by Lamarck. But this error, as has already been pointed out, does not justify Müller in reducing *C. africana*, Poir., to *C. daphnoides*, Lamk.

34. **Cluytia vaccinioides**, *Prain*; fruticulus valde ramosus; rami prostrati, 30–60 cm. longi, minute pubescentes; folia coriacea, sessilia vel subsessilia, elliptica vel oblonga, saepissime obtusa, basi late cuneata vel rotundata, margine plana, inferiora 1·2 cm. long, 8 mm. lata, cetera sursum gradatim minora, pilis paucis secus costam supra exceptis glabra, utrinque praesertim juniora distincte verruculosa, opaca, margine subhyalina; flores dioici, lutescentes, maculis coccineis notata, in axillis solitaria; pedicelli maris calycem subaequantes, parce pubescentes; sepala maris parce hirsuta, obovata minopere retusa, 4 mm. longa, glandula basali alte 3-loba aucta; petala manifeste unguiculata, obcordata, retusa, calyce breviora, glabra, singula glandulis minutis 3 ipso basi induta; ovarii rudimentum brevissimum, glabrum; flores feminei ignoti. C. Thunbergii, β vaccinioides, *Pax et K. Hoffm, in Engl. Pflanzenr.* —*Euphorb. Cluyt.* 76 (1911).

Coast Region: Riversdale Div.; near Riversdale, *Rust*, 619, 620. Mossel Bay Div.; between Little Brak River and Hartenbosch, *Burchell*, 6216.

As regards foliage *C. vaccinioides* is almost exactly intermediate between *C. crassifolia*, Pax and *C. Thunbergii*, Sond., of which latter species Dr. Pax has treated it as only a variety.

35. **Cluytia Thunbergii**, *Sond. in Linnaea*, xxiii. 130 (1850); *Baill. Adansonia*, iii. 152 (1862); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 76, *var.* β *exclus.* (1911). C. tomentosa, *Thunb. Prodr. Pl. Cap.* 53 (1794) et *Fl. Cap. ed. Schult.* 271, *quoad spp. fem.* (1823); *E. Mey. in Drège, Zwei Pfl. Documente*, 174 (1843); *nec Linn.* C. pubescens, *Willd. Sp. Pl.* iv. 2, 881 (1805); *Pers. Synops.* ii. 636 (1807); *Poir. Encyc. Meth. Suppl.* ii. 303 (1810); *Spreng. Syst.* iii. 49 (1826); *Dietr. Synops.* v. 455 (1852); *nec Thunb.* C. daphnoides, γ Thunbergii, *Müll. Arg. in DC. Prodr.* xv. 2, 1050 (1866). C. karreensis, *Schlechter MSS. ex Pax*, l.c. (1911).

Central Region: Prince Albert, Beaufort West and Fraserburg Divs.

Western Region: Little Namaqualand.

Cluytia Thunbergii was in 1843 tentatively identified by E. Meyer with *C. tomentosa*, Linn., a species from which this differs in having a glabrous ovary and more numerous petaline or intra-petaline glands. Sonder in 1850 described the species for the first time, and applied the name it now bears because of his belief that this is the plant described in Schultes' edition of Thunberg's *Flora Capensis* as *C. tomentosa*. According to Müller, however, the *C. tomentosa* of the work in question is *C. daphnoides*, while the *C. tomentosa* of E. Meyer is only a variety of *C. daphnoides*. The truth appears to lie somewhere between these two views. The description of *C. tomentosa* given in the *Flora Capensis* certainly accords with that of *C. daphnoides*, Lamk; moreover, of two specimens, a male and a female, written up as *C. tomentosa* in herb. Thunberg, the male certainly is *C. daphnoides*, Lamk. But the female specimen is not quite like the male; it has very much shorter leaves and resembles the *C. tomentosa* of E. Meyer—the *C. kareensis* of Schlecter, more closely than it does *C. daphnoides*. Sonder was not the only botanist to arrive at this conclusion. There is a specimen in herb. Willdenow (n. 18599) of the same form as is represented by the female sheet of *C. tomentosa*, Thunb., not of Linn. Willdenow knew and figured *C. daphnoides*, Lamk, yet it did not occur to him to include this short-leafed plant in Lamarck's species; he described it as *C. pubescens* under the mistaken impression that it might be Thunberg's species so named. There is also a specimen in herb. Linnaeus of the plant collected by Thunberg as well as one of the true *C. daphnoides*, Lamk; it did not occur to Linnaeus that the two are conspecific. Linnaeus never did give a name to his specimen of *C. daphnoides*; his specimen of Thunberg's female plant he wrote up as *C. tomentosa*, Mant. *femina*, a species which he had described in 1771 from a male specimen only, but which is very different from this one.

In dealing with this problem Pax has adopted a middle course. The *C. tomentosa* of Thunberg he has, following Müller, merged

wholly in *C. daphnoides*; the *C. tomentosa* of E. Meyer he has, following Sonder, maintained as a species apart. The disadvantage of this treatment appears in connection with the female portion of *C. tomentosa* Thunb., which certainly cannot be merged in *C. daphnoides*. Neither can it, unequivocally, be merged in *C. Thunbergii*. This female plant appears to be rather a form intermediate between *C. daphnoides*, Lamk, and *C. Thunbergii*, Sond., with the fruits of the former and the foliage of the latter, and the most natural course may therefore be to follow Müller in treating *C. Thunbergii* as a variety of *C. daphnoides*, but in recognising the female portion of *C. tomentosa*, Thunb., not of Linn., as a distinct variety differing from, and at the same time linking up, both *C. daphnoides* and *C. Thunbergii*. One difficulty which impedes a final settlement is that there is no clue to the particular area whence the specimens in herb. Linnaeus, herb. Thunberg and herb. Willdenow were obtained. In spite of the same plant having found a place in each of these herbaria no one appears ever to have collected it in South Africa again. For the moment therefore it appears better to follow Sonder in his treatment than to adopt that of Müller and of Pax. If the latter should prove to have taken the more natural view, the synonym *C. pubescens* with all its citations and the synonym *C. tomentosa*, as used by Thunberg but not as used by E. Meyer, will require to be transferred to *C. daphnoides*.

36. **Cluytia crassifolia**, *Pax in Bull. Herb. Boiss.* vi. 736 (1898), et *in Engl. Pflanzenr.—Euphorb. Cluyt.* 71 (1911).

Western Region : Great Namaqualand.

Cluytia crassifolia has been compared by its author with *C. Alaternoides*, but the arrangement of its intrapetaline glands is such as make its association with that species and with the section *Alaternoideae* rather unsatisfactory. On the other hand, but for a difference in the rudimentary ovary of the male flower, it might be easy to mistake this species for a glabrous state of *C. Thunbergii*, Sond.

¶ 10. **Polygonoideae**, *Prain.*—Folia ericoidea, coriacea, glabra, nitentia, supra convexa, subtus margine revoluta. *Revolutae*, Pax et K. Hoffm. in Engl. Pflanzenr.—Euphorb. Cluyt. 77, pro parte minima et quoad *C. polygonoiden* tantum.—Species 1; *C. polygonoides*.

37. **Cluytia polygonoides**, *Linn. Sp. Pl.* ed. 2, 1475 [Clutia] (1763); *Burm. f. Prodr.* 27 bis [31] (1768); *Lamk, Encyc. Meth.* ii. 54 (1786); *Thunb. Prodr. Pl. Cap.* 53 (1794), et *Fl. Cap. ed. Schult.* 270 (1823); *Müll. Arg. in DC. Prodr.* xv. 2, 1054, *var. amb. incl.* (1866); *Pax in Engl. Pflanzenr.—Euphorb. Cluyt.* 78 *var. amb. incl.* (1911). C. Alaternoides, *Linn. Sp. Pl.* 1042, *partim et quoad Burm.* t. 43, fig. 3 *tantum* (1753). C. tabularis, *Eckl. Un. It.* 199 [nomen] (1832); *Eckl. et Zeyh. ex Sond.* l.c. (1850). C. curvata, *E. Mey. in Drège, Zwei Pfl. Documente*, 174 [nomen] (1843). C. ericoides, *E. Mey.* l.c., *partim* (1843), *Krauss in Flora*, xxviii. 82 (1845); *Eckl. et Zeyh. ex Sond. in Linnaea*, xxiii. 122 (1850); *nequaquam Thunb.* C. diosmoides, *Sond.* l.c., *var.* β *inclus.* (1850); *Baill. Adansonia*, iii. 152, *var.* β *inclus.* (1862). C. daphnoides, *Eckl. et Zeyh. ex Sond.* l.c. (1850); *nequaquam Lamk.*

Coast Region: Clanwilliam, Malmesbury, Tulbagh, Worcester, Paarl, Cape, Stellenbosch, Caledon, Swellendam, Riversdale, Mossel Bay and (according to Ecklon and Zeyher) also Cathcart Divs.

Cluytia polygonoides is the plant figured by Burmann in 1738 (Pl. Afr. Rar. 48, t. 43, fig. 3) which Linnaeus in 1753 included in *C. Alaternoides*, but to which, in 1763, he accorded the status of a distinct species, while at the same time leaving it also in its old place. It is the *C. polygonoides* of the younger Burmann, of Lamarck and of Thunberg, but, as the outcome of a misapprehension, is not the *C. polygonoides* of Willdenow, whose plant (herb. Willd. n. 18593) is what we have here described as *C. rubricaulis*, Eckl., γ *grandifolia*, Krauss. This misinterpretation by Willdenow had been adopted by Poiret, Aiton, Sonder, Krauss and Baillon and was not cleared away until 1866 when Müller once more placed the species on a sound footing. Linnaeus not only left the plant in two places (Sp. Pl. ed. 2, 1475), his herbarium shows that he included under the name two species, one sheet written up by him as *C. polygonoides* being *C. ericoides*. The specimens of Drège issued by E. Meyer show the converse confusion, both *C. polygonoides* and *C. ericoides* having been distributed in 1843 under the latter name. Two years later Krauss repeated this error but in a modified fashion, for he treated these two species as varietally separable; *C. ericoides*, Krauss, is really *C. polygonoides*, what Krauss has issued as *C. ericoides*, var. *minor*, being really *C. ericoides*. While there is no doubt, from the specimens in his herbarium, that this is *C. polygonoides* as understood by Thunberg, the statement made in the description edited by Schultes that the leaves of this species are petioled requires qualification. The leaves are articulated at their organic base to a rather distinct pulvinus, but they cannot properly be described as stalked. The names *C. tabularis*, Eckl., and *C. diosmoides*, Sond., in themselves unexceptionable, do not require to be taken up, they were only given because their authors both believed that the name *C. polygonoides* belonged by right to the plant figured as such by Willdenow. There is some reason to suppose that the name *C. curvata*, employed by E. Meyer, was used for the same reason, because it seems possible that the mixture of *C. polygonoides* with *C. ericoides* under the latter name was the result of inadvertence rather than of misapprehension. Sonder and Baillon, Müller and Pax have, however, thought differently, and have treated *C. curvata*, E. Mey., as a distinct variety. For this there seems no justification, the form in question is merely a condition, not a variety. There is, in herb. Stockholm, a specimen somewhat different in facies from any other known one, which has been written up by Sonder "transitus in var. curvatam." It is marked 'Ecklon and Zeyher n. 51' and ought therefore to be from somewhere "between Windvogelberg and the Zwartkei River" in Cathcart Division. No other collector has found the plant in a locality so far to the east, and this record should be treated, until further evidence is available, as a rather doubtful one.

LXI.—MISCELLANEOUS NOTES.

Mr. George Stephen Crouch, until recently a member of the gardening staff of the Royal Botanic Gardens, has been appointed, on the recommendation of Kew, an Assistant Director of Horticulture in the Egyptian Department of Agriculture.

Mr. Thomas Henry Parsons, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Curator of the Royal Botanic Gardens, Peradeniya, Ceylon, in succession to Mr. H. F. Macmillan (*K.B.*, 1895, p. 155) who has been appointed Superintendent of Horticulture in the Department of Agriculture, Ceylon.

Mr. C. E. F. Allen, formerly a member of the gardening staff of the Royal Botanic Gardens (*K.B.*, 1904, p. 13) has been appointed Curator of the Botanic Garden, Port Darwin, Northern Territory, South Australia, in succession to Mr. N. Holtze, deceased (*K.B.*, 1913, p. 233).

Botanical Magazine for December.—The plants figured are *Morenia corallina*, Karst. (t. 8527); *Genista hispanica*, Linn. (t. 8528); *Rhododendron nigropunctatum*, Bur. et Franch. (t. 8529); *Derris oligosperma*, K. Schum. et Lauterb. (t. 8530) and *Cirrhopetalum Mastersianum*, Rolfe (t. 8531).

The volume for the year, which concludes with this number of the Botanical Magazine, is dedicated—"To Sir Frank Crisp, Baronet, of Friar Park, Henley-on-Thames, whose interest in the objects to whose services this work is devoted is only equalled by his generosity to the Institution wherein it is prepared."

Morenia corallina is a Colombian species of this small genus of graceful Andine Palms. The genus is closely allied to *Chamaedorea*, Willd., but is easily distinguished in having a three-toothed in the place of an annular or patelliform calyx in the male flower. The Kew plant which supplied the material for the illustration has been in cultivation for many years, and thrives well in the moist conditions of the Aroid House.

Genista hispanica has long been a favourite garden shrub in Southern England. Its native habitat extends from Portugal to Liguria in North-Western Italy and it is most nearly allied to *G. gibraltarica*, DC. and *G. decipiens*, Spach. From the former it is distinguished by the shorter and denser inflorescence, from the latter by the subequal petals. The plant figured was grown in the open at Kew.

The tiny *Rhododendron nigropunctatum* is one of the small species found on grass lands on the mountains of Szechuan in Western China at elevations of from 10,000–15,000 feet. It was collected in this region by Mr. E. H. Wilson, though it had previously been found by French travellers and described from their specimens. The plant which furnished material for the figure was presented to

Kew by Messrs. Veitch in 1910, and although then eight years old was only ten inches high. *R. intricatum*, Franch., is most nearly allied to *R. nigropunctatum*.

Derris oligosperma, a member of the *Brachypterum* section of the genus, is a powerful woody evergreen climber which has been in cultivation in the Temperate House at Kew for over twenty-five years. It was raised from seed sent from the Richmond River in New South Wales, and on flowering in 1904 was described as a new *Wistaria*. On fruits becoming available its true position was apparent, and it was found to be identical with the species which has been generally accepted by botanists interested in Australian plants as *D. scandens*. It is not, however, the true *D. scandens* of India and Indo-China, but a distinct species, and may be regarded as its south-eastern representative.

The *Cirrhopetalum* was first introduced from the Dutch East Indies by Messrs. Linden of Brussels. It flowered in June, 1890, and was named in compliment to the late Dr. M. T. Masters. The plant figured was received at Kew from the Royal Botanic Gardens, Glasnevin, in 1903. *C. Mastersianum* is very distinct from the majority of the species of this genus in cultivation; it is most nearly comparable with *C. gamosepalum*, Griff., but is quite different in colour and has the ciliae of the petals and dorsal sepal very minute.

Hibiscus asper.—Described in 1849 by J. D. Hooker (Niger Fl. p. 228) from an imperfect specimen collected in Sierra Leone, *H. asper* was reduced along with other species to *H. cannabinus* by Masters in 1868 (Fl. Trop. Afr. vol. i. p. 204). Hochreutiner in 1900 went even further in extending the limits of *H. cannabinus*, which he regarded as being very variable (Annuaire Conserv. & Jard. Bot. Genève, vol. iv. p. 114). Study of the material now contained in the Kew Herbarium shows that *H. asper* can be distinguished from *H. cannabinus* by several characters which, taken together, seem to warrant its restoration to specific rank, namely, the repand lobing of the leaf segments, the small subglobose capsule, and the smaller, more rounded, minutely and densely tubercled seeds with a setose sinus. The synonymy and distribution of *H. asper* are as follows:—

Hibiscus asper, *Hook. f.* in Hook. Niger Fl. p. 228. *H. cannabinus*, Mast. in Oliv. Fl. Trop. Afr. vol. i. p. 204, pro parte; Hochreutiner in Annuaire Conserv. & Jard. Bot. Genève, vol. iv. p. 114, parte minima.

Tropical Africa. Sierra Leone: without locality, *Miss Turner*; common on open grassy ground, near Mahela, *Scott Elliot* 4041; Scarcies, in alluvium of Kora, *Scott Elliot* 4592. French Guinea: Kouria, *Chevalier* 14,909. Dahomey, *Burton*. Northern Nigeria: Nupe, *Barter* 1026; Katagum District, common in the bush, *Dalziel* 65 (mixed with *H. cannabinus*); Zungeru, *Dalziel* 128; Sokoto Province, in damp ground and waste places, *Dalziel* 426. Lagos, *Higginson* 11. Southern Nigeria, *Foster* 362. Jur: Great Seriba Ghattas, *Schweinfurth* 2374.

Nyasaland: abundant near the foothills of the Liwonde District (infructescence received from Imperial Institute). Portuguese East Africa: Shamo, *Kirk*.

Madagascar. Beravi, *Hildebrandt* 3086; without locality, *Grevé*, 166.

H. asper grows to a height of about 5 feet, and, like *H. cannabinus*, has yellow flowers with a red centre (*Higginson*). It is known under the following native names: yakuar kwadi (N. Nigeria, Katagum District), karama mowa (N. Nigeria, Sokoto District), pode agageru (Lagos), awon ekim (Lagos), keke (S. Nigeria). According to Higginson, a good fibre about five feet long is obtained from it in Lagos. *H. asper* is possibly identical with *H. obtusatus*, Schum. & Thonn. (Beskr. Guin. Pl. p. 321), judging from the description of the latter species, which was also reduced to *H. cannabinus* by Masters (Fl. Trop. Afr. vol. i. p. 204).

T. A. S.

Burmese Woody Plants.*—Since the publication of Kurz's well known Forest Flora of British Burma no exhaustive work dealing with the woody plants of Burma has appeared. The first part of the present work is devoted to a list of the woody plants of Burma arranged after the Flora of British India except that the species under the genus are arranged alphabetically. In parallel columns are given the habit of the species whether tree, shrub, climber, epiphyte, &c., and also the native names in the various districts where known. In the second part we have a vernacular-botanical index to the Burmese, Kachin, Karen and Shan names as also a reference to the page on which the species may be found in the first part.

Mr. Lace who has been an ardent collector and has always taken a keen scientific interest in his work is to be congratulated on the thoroughness of this very useful pocket book.

W. G. C.

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* List of Trees, Shrubs and Principal Climbers, etc., recorded from Burma, with Vernacular Names, by J. H. Lace, F.L.S., Chief Conservator of Forests.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX I.—1913.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1912. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained after the end of February.

HERBACEOUS PLANTS.

Acaena adscendens.
glauca.
macrostemon.
microphylla.
myriophylla.
Novæ-Zealandiae.

Acanthus longifolius.
Perringii.

Achillea Ageratum.
argentea.
grandiflora.
obscura.
Wolczeckii.

Aconitum cernuum.
Kusnezoffi.
rostratum.

Aconitum—*cont.*
Stoerckianum.
uncinatum.
volubile.

Actaea spicata.
— var. rubra.

Actinella scaposa.

Adenophora denticulata.
verticillata.

Aethionema cappadocicum.
cristatum.
grandiflorum.
iberideum.
pulchellum.
saxatile.

(27247—6a.) Wt. 189—808. 1125. 12/12. D & S. A

Agrimonia odorata.
pilosa.
repens.

Agropyron pungens.

Agrostis alba.
elegans.
nebulosa.

Aira caryophyllea.

Allium Ampeloprasum.
cyaneum.
Fetisowii.
grande.
kansuense.
karataviense.
margaritaceum.
neapolitanum.
odorum.
paradoxum.
pulchellum.
sphaerocephalum.
Wallichii.

Alstroemeria aurantiaca.
revoluta.

Althaea armeniaca.
cannabina.
ficifolia.
kurdica.
nudiflora.
pallida.
pontica.
rosea.
sulphurea.
taurinensis.

Alyssum argenteum.
incanum.
podolicum.
pyrenaicum.
saxatile var. citrinum.
spinosum.

Amarantus caudatus.
hypochondriacus.
polygamus.
retroflexus.
speciosus.

Amellus annuus.

Amethystea caerulea.

Ammi Visnaga.

Ammobium alatum.

Anacyclus officinarum.
Pyrethrum.

Anaphalis triplinervis.

Anchusa Barrelieri.
capensis.
italica.

Androsace occidentalis.

Anemone alpina.
decapetala.
multifida.
pratensis.
Pulsatilla.
rivularis.
sylvestris.

Anoda hastata.
Wrightii.

Anthemis mixta.

Anthericum Liliago.
ramosum.

Antirrhinum Asarina.
hispanicum.
Orontium.
tortuosum.

Apera interrupta.
Spica-Venti.

Apocynum androsaemifolium.

Aquilegia canadensis.
chrysantha.
coerulea.
glandulosa.
pyrenaica.

Arabis alpina.
arenosa.
hirsuta.
Sturii.
verna.

Aralia californica.
racemosa.

Arctotis stoechadifolia.

Arenaria aretioides.
capillaris.
cephalotes.
foliosa.
gothica.
graminifolia.
grandiflora.
liniflora.
pinifolia.
purpurascens.
sojanensis.

Argemone grandiflora.
hispida.
mexicana.

Armeria canescens.
chilensis.
majellensis.

Arnica amplexicaulis.
foliosa.
longifolia.
montana.
sachalinensis.

Artemisia lanata.
paniculata.
parviflora.
scoparia.
Siversiana.

Arthropodium cirrhatum.

Asperula azurea.
ciliata.
galioides.
longiflora.

Asphodeline lutea.

Asphodelus albus.

Aster alpinus.
batangensis.
Coulteri.
Douglasii.
foliaceus.
glaucus.
Herveyi.
junceus.
macrophyllus.
radula.
subcaeruleus.

Astilbe chinensis.
rivularis.
simplicifolia.
Thunbergii.

Astragalus alopecuroides.
alpinus.
chinensis.
danicus.
Echinus.
frigidus.
Glyciphyllos.
maximus.
Onobrychis.
pentaglottis.
xiphocarpus.

Astrantia Biebersteinii.
helleborifolia.

Athamanta Matthioli.

Atriplex littoralis.
nitens.
rosea.

Atropa Belladonna.
lutescens.

Aubrietia croatica.

Baeria coronaria.

Baptisia australis.
tinctoria.

Barbarea arcuata.
intermedia.
praecox.

Beckmannia erucaeformis.

Berkheya Adlami.

Bèta Bourgaei.
trigyna.

Bidens leucantha.

Biscutella auriculata.
ciliata.
didyma.
laevigata.

Blumenbachia insignis.
muralis.

Bocconia cordata.
microcarpa.

Boehmeria platyphylla.

Bongardia Rauwolfii.

Brachycome iberidifolia.
— var. alba.

Brachypodium caespitosum.
japonicum.
pinnatum.
sylvaticum.

Brassica campestris.
Cheiranthos.
Erucastrum.

Brassica—*cont.*
juncea.
rugosa.
Tourneforti.

Briza maxima.

Bromus adoënsis.
breviaristatus.
carinatus.
ciliatus.
commutatus.
japonicus.
Kalmii.
macrostachys.
marginatus.
maximus.
polyanthus.
Porteri.
rubens.
sitchensis.
squarrosus.
Tacna.
Trinii.
unioloides.

Bulbine annua.
longiscapa.

Bunias orientalis.

Buphthalmum salicifolium.

Bupleurum Candollei.
rotundifolium.
tenuissimum.

Cakile maritima.

Calamagrostis confinis.
Epigeios.

Calandrinia speciosa.

Calceolaria integrifolia.
mexicana.
polyrrhiza.

Callirhoë involucrata.
lineariloba.
pedata.

Callistephus hortensis.

Camassia esculenta.
Fraseri.
Leichtlinii.
montana.

Camelina sativa.

Campanula alliariaefolia.
barbata.
bononiensis.
collina.
Imeretina.
Kolenatiana.
lactiflora.
lanata.
latifolia.
latiloba.
longistyla.
macrostyla.
patula.
phyctidocalyx.
punctata.
sarmatica.
Scheuchzeri.
sibirica.
speciosa.
spicata.
thyrsoides.
Waldsteiniana.

Capsella grandiflora.

Carbenia benedicta.

Carduncellus coeruleus

Carduus defloratus.
tenuiflorus.

Carex arctata.
Gravii.
hordeistichos.
pendula.
tomentosa.

Carthamus lanatus.
tinctorius.

Carum copticum.

Catananche coerulea.
lutea.

Celsia orientalis.

Cenia turbinata.

Centaurea axillaris.
dealbata.
montana.
nigrescens.
pulchra.
ruthenica.
spicata.

Centranthus macrosiphon.
Sibthorpii.

Cephalaria alpina.
ambrosoides.
transsylvanica.

Cerastium Biebersteinii.
macranthum.
perfoliatum.
tomentosum.

Cerinthe major.

Chaerophyllum aromaticum.
nodosum.

Charieis heterophylla.

Chelone Lyoni.
obliqua.

Chelonopsis moschata.

Chenopodium Bonus-Henricus.
capitatum.
foetidum.
urbicum.

Chlorogalum pomeridianum.

Chorispora tenella.

Chrysanthemum Balsamita var.
tomentosum.
carinatum.
caucasicum.
cinerariaefolium.
coronarium.
corymbosum.
Myconis.
pallens.
prealtum.
viscosum.

Chrysopogon Gryllus.

Cimicifuga cordifolia.
foetida.
racemosa.

Cladium Mariscus.

Clarkia elegans.
pulchella.

Claytonia asarifolia.

Cleome viscosa.

Clypeola Jouthlaspi.

Cnicus arachnoideus.
syriacus.

Cochlearia glastifolia.

Codonopsis clematidea.
ovata.

Colchicum laetum.

Collinsia bartsiaefolia.
bicolor.
grandiflora.
verna.

Collomia coccinea.
gilioides.
grandiflora.

Comanthospace sublanceolata.

Convolvulus Cupanianus.
farinosus.
tricolor.
undulatus.

Coreopsis lanceolata.

Coriandrum sativum.

Corispermum nitidum.

Coronilla cappadocica.
scorpioides.

Corydalis capnoides.
glauca.
lutea.
racemosa.

Corynephorus canescens.

Cosmidium Burridgeanum.

Cosmos diversifolius.

Crambe orientalis.

Crepis aurea.
blattarioides.
grandiflora.
pygmæa.
rubra.
sibirica.

Crocus asturicus.
aureus.
chrysanthus.
hadriaticus.
Imperati.
longiflorus.
medius.
pulchellus.
speciosus.
Sieberi.
Tommasinianus.

Crucianella aegyptiaca.

Cynoglossum cheirifolium.
microglochin.
nervosum.
Wallichii.

Cynosurus echinatus.

Cyperus esculentus.

Dactylis altaica.
Aschersoniana.

Dahlia Merckii.
variabilis.

Datisca cannabina.

Datura Tatula.

Delphinium Brunonianum.
caucasicum.
consolida.
decorum.
dyctiocarpum.
elatum.
formosum.
Geyeri.
grandiflorum.
Maackianum.
occidentale.
orientale.
speciosum.
— var. glabratum.

Demazeria loliacea.

Deschampsia caespitosa.
tenella.

Desmodium canadense.

Deyeuxia Langsdorfii.

Dianthus arenarius.
Armeria.
caesius.
capitatus.
Caryophyllus.
deltoides.
fragrans.
giganteus.
hirtus.
Knappii.
leptopetalus.
liburnicus.
neglectus.
petraeus.
Requienii.
Seguieri.
squarrosus.
subacaulis
superbus.
Waldsteinii.

Diascia Barberae.

Dictamnus albus.

Digitalis ambigua.

Dimorphotheca aurantiaca.
hybrida.

Diplachne fasciculare.

Dipsacus asper.
atratus.
inermis.
plumosus.

Dischisma spicatum.

Dodecatheon Hendersoni.
Meadia.

Dorycnium herbaceum.

Downingia elegans.

Draba alpina.
altaica.
Athoa.
aurea.
cuspidata.
fladnizensis.
grandiflora.
incana.
longirostra.
nivalis.
rigida.

Dracocephalum heterophyllum.
Moldavica.
nutans.
peltatum.
Ruyschiana.

Dulichium spathaceum.

Ecballium Elaterium.

Eccremocarpus scaber.

Echinacea purpurea.

Echinaria capitata.

Echinodorus ranunculoides.

Echinops dahuricus.
Ritro.

Echium creticum.
plantagineum.

Elsholtzia cristata.

Elymus giganteus.

Emilia flammea.

Encelia calva.

Epilobium Dodonaei.
nummularifolium.

Epipactis palustris.

Eragrostis abyssinica.

Eremostachys laciniata var. iberica.

Erigeron alpinus.
aurantiacus.
glabellus.
glaucus.
grandiflorus.
macranthus.
Rusbyi.
trifidus.

Erinus alpinus.

Eriophyllum caespitosum.

Erodium amanum.
cheilanthifolium.
daucoides.
macradenum.
malacoides.
Manescavii.

Eruca sativa.

Eryngium agavefolium.
amethystinum.
Bourgati.
giganteum.
planum.
Serra.

Erysimum Perofskianum.
rupestre.

Erythronium revolutum.

Eschscholzia caespitosa.
californica.
Douglasii.

Eucharidium concinnum.

Eupatorium ageratoides.
purpureum.

Euphorbia Heldreichii.
Kotschyana.

Felicia tenella.

Ferula tingitana.

Festuca gigantea.
Myuros.
Poa.
rigida.
uniglumis.
vaginata.

Fragaria indica.

Galactites tomentosa.

Galega orientalis.
patula.

Galeopsis Ladanum.
Tetrahit.

Galium thymifolium.

Gastridium australe.

Gazania pygmaea.

Gentiana asclepiadea.
— var. alba.
Cruciata.
dahurica.
decumbens.
Freyniana.
robustus.
septemfida.
straminea.
tibetica.
Walujewi.

Geranium albiflorum.
eriostemon.
grandiflorum.
ibericum.
incisum.
nepalense.
rivulare.
sessiliflorum.
yedoense.

Gerbera Anandria.
nivea.

Geum album.
chiloense.
coccineum.
Heldreichii.
montanum.

Gilia achilleaefolia.
androsacea.
— var. alba.
capitata.
densiflora.
liniflora.
micrantha.
multicaulis.
squarrosa.
tricolor.

Gillenia trifoliata.

Glaucium corniculatum.
— var. tricolor.
leiocarpum.

Globularia incanescens.
vulgaris.

Glyceria distans.

Grammanthes gentianoides.

Grindelia cuneifolia.
robusta.

Gypsophila acutifolia.
elegans.
muralis.
paniculata.
prostrata.
Steveni.
viscosa.

Hastingsia alba.

Hebenstretia tenuifolia.

Hedysarum altaicum.
flavescens.
Semenovii.

Helenium Bigelovii.
Hoopesii.

Helianthemum Tuberaria.

Helianthus cucumerifolius.
Nuttallii.
occidentalis.

Helichrysum bracteatum.

Heracleum Mantegazzianum.
persicum.
pyrenaicum.

Hesperis matronalis.

Heuchera Drummondi.
foliosa.
pilosissima.

Hibiscus Trionum.

Hieracium alpinum.
amplexicaule.
Bornmülleri.
Grisebachii.
villosum.

Hilaria rigida.

Hordeum bulbosum.
jubatum.
maritimum.

Horminum pyrenaicum.

Hunnemannia fumariaefolia.

Hymenophysa pubescens.

Hyoscyamus albus.

Hypecoum grandiflorum.

Hypericum Ascyrum.
Coris.
hirsutum.
linarifolium.
olympicum.
tomentosum.

Hypochaeris glabra.

Iberis Amara.
Jordani.
Lagascana.

Impatiens amphorata.
scabrida.

Inula barbata.
ensifolia.
Hookeri.
macrocephala.
orientalis.
racemosa.
Royleana.
squarrosa.

Iris bucharica.
caroliniana.
juncea.
Leichtlini.
missouriensis.
tingitana.

Isatis glauca.

Jasione perennis.

Juncus alpinus.
Chamissonis.

Jurinia cyanoides.

Kitaibelia vitifolia.

Kochia trichophila.

Koeleria albescens.
phleoides.
splendens.

Lactuca Bourgaei.
perennis.

Lagascea mollis.

Lagurus ovatus.

Lallemantia canescens.

Lathyrus angulatus.
Aphaca.
articulatus.
cirrhosus.
Clymenum.
cyaneus.
filiformis.
luteus.
maritimus.
Nissolia.
Ochrus.
pisiformis.
rotundifolius.
setifolius.
tingitanus.
tuberosus.
undulatus.
variegatus.
venosus.

Lavatera cachemiriana.
trimestris.
— var. alba.

Layia platyglossa.

Leonurus Cardiaca.
sibiricus.
tataricus.

Leptosyne Douglasii.
maritima.
Stillmanni.

Leuzea conifera.

Liatris spicata.

Libertia ixioides.

Ligusticum alatum.
discolor.
scoticum.

Lilium Parryi.
parvum.
roseum.
tenuifolium.

Limnanthes alba.

Linaria anticaria.
aparinoides.
bipartita.
macedonica.

Linaria—*cont.*
maroccana.
multipunctata.
repens.
saxatilis.
tristis.
viscida.

Linum angustifolium.
capitatum.
nervosum.
usitatissimum.

Lippia nodiflora.

Lobelia linnaeoides.
sessilifolia.

Lonas inodora.

Lotus ornithopodioides.
Requienii.
Tetragonolobus.

Lunaria annua.

Lupinus angustifolius.
concinnus.
Douglasii.
elegans.
Hartwegii.
micranthus.
nanus.
pilosus.
pubescens.
sulphureus.

Luzula Hosti.
nivea.

Lychnis alpina.
chalcedonica.
fulgens.
Lagascae.
Preslii.
Sartori.

Lysimachia barystachya.
clethroides.
davurica.
punctata.

Madia dissitiflora.
sativa.

Malcolmia africana.
chia.

Malope trifida.

Malva Duriaei.
oxyloba.
parviflora.

Malvastrum limense.

Matthiola sinuata var. glabra albiflora.
tricuspidata.

Meconopsis aculeata.
cambrica.
heterophylla.
racemosa.
sinuata var. latifolia.

Medicago Echinus.
Helix.
hispida.
littoralis.
Murex.
orbicularis.
scutellata.
turbinata.

Melica altissima.
ciliata.

Mimulus cardinalis.
Lewisii.

Mirabilis divaricata.
Jalapa.
longiflora.

Molinia coerulea.

Monarda didyma.
fistulosa.

Monolepis trifida.

Moscharia pinnatifida.

Muhlenbergia mexicana.

Muscari armeniacum.
compactum.
Massyanum.
neglectum.
paradoxum.

Myosurus minimus.

Myriactis Gmelini.

Nardus stricta.

Nepeta caesarea.
concolor.
discolor.
macrantha.
nuda.
Sibthorpii.

Nicandra physaloides.

Nicotiana affinis.
campanulata.
Langsdorffii.
paniculata.
rustica.
Sanderae.
Tabacum.

Nigella corniculata.
damascena.
hispanica.

Ochthodium aegyptiacum.

Oenothera albicaulis.
Romanzowii.
rosea.
tenella.
tenuifolia.

Omphalodes linifolia.

Ononis alopecuroides.
hircina.
natrix.

Onopordon Acanthium.
arabicum.

Ornithogalum narbonense.

Oryzopsis miliacea.

Oxyria digyna.

Oxytropis campestris.
ochroleuca.
pilosa.

Paeonia decora var. alba.
microcarpa.
mollis.
paradoxa.
Veitchii.

Panicum capillare.

Papaver alpinum.
Argemone.
commutatum.
glaucum.
nudicaule.
orientale.
pavoninum.
rupifragum.
somniferum.

Parrya Menziesii.

Pelargonium australe.

Peltaria alliacea.

Pennisetum macrourum.

Pentstemon acuminatus.
campanulatus.
confertus.
deustus.
diffusus.
glaucus.
gracilis.
heterophyllus.
humilis.
laevigatus.
ovatus.
pubescens.
secundiflorus.
triflorus.
virgatus.

Perovskia atriplicifolia.

Phacelia congesta.
malvaefolia.
Parryi.
tanacetifolia.
viscida.

Phalaris aquatica.
minor.
paradoxa.

Phleum arenarium.
asperum.
Michelii.

Phlomis cashmiriana.
pratensis.
tuberosa.
umbrosa.
viscosa.

Phlox glaberrima.

Physalis Alkekengi.
Bunyardi.
Francheti.
ixiocarpa.

Physochlaina orientalis.

Physostegia virginiana.

Phyteuma canescens.
Michelii.
orbiculare.
Scheuchzeri.
serratum.

Phytolacca acinosa.

Plantago Candollei.
Coronopus.
maritima.
maxima.
ovata.
Psyllium.

Platycodon glaucum.
grandiflorum.
— var. Mariesii.

Plectranthus glaucocalyx.

Plumbago micrantha.

Poa abyssinica.
caesia.
violacea.

Podolepis chrysantha.

Podophyllum Emodi.

Polemonium flavum.
grandiflorum.
mexicanum.
pauciflorum.

Polycalymna Stuartii.

Polygonum affine.
alpinum.
Emodi.
Laxmanni.
rude.
viviparum.
Weyrichii.

Polypogon littoralis.

Portulaca grandiflora.

Potentilla arguta.
argyrophylla.
crinita.
dealbata.
Detommasii.
Fenzlii.
glandulosa.
gracilis.
Herbichii.
Hippiana.
Meyeri.
mollis.
montenegrina.
multifida.
nepalensis.
nevadensis.
norvegica.
pennsylvanica.
recta.
rivale.
rupestris.
semilaciniata.
sericea.
tanacetifolia.
Thurberi.

Pratia angulata.

Prenanthes altissima.
purpurea.

Primula angustidens.
Bulleyana.
capitata.
frondosa.
involucrata.
mollis.
Palinuri.
pulverulenta.
verticillata.

Psoralea acaulis.
macrostachya.
physodes.

Pycnanthemum pilosum.

Ramondia pyrenaica.

Ranunculus Nyssanus.

Rehmannia chinensis.

Reseda virgata.

Rhagadiolus edulis.

Rheum Alexandrae.
Webbianum.

Rodgersia pinnata.
podophylla.

Roemeria hybrida.

Romulea candida.

Rudbeckia amplexicaulis.
arifolius.
californica.
hymenosepalus.
speciosus.
subtomentosa.

Rumex maximus.
orientalis.
salicifolius.
sanguineus.

Salvia argentea.
Bertolonii.
bicolor.
carduacea.
Columbariae.
globosa.
grandiflora.
Horminum.
japonica.
Przewalskyii.
Schiedeana.
Sclarea.
taraxifolia.
tiliaefolia.
verticillata.
virgata.
viridis.

Sambucus Ebulus.
— var. latifolius.

Saponaria ocymoides.
Vaccaria.

Saussurea albescens.
alpina.
discolor.
hypoleuca.
salicifolia.

Saxifraga ambigua.
bronchialis var. cherlerioides.
caespitosa.
cochlearis.
— var. minor.
decipiens.
granulata.
Hausmanni.
lingulata var. lantoscana.
luteo-viridis.
mutata.
pedemontana.
rotundifolia.
sponhemica.
tellimoides.
trifurcata.
virginiensis.

Scabiosa brachiata.
caucasica var. connata.
crenata.
graminifolia.
Kitaibelii.
longifolia.
vestina.

Schizanthus Grahami.
pinnatus.

Scilla autumnalis.
monophyllos.

Sclerocarpus uniserialis.

Scolymus grandiflorus.

Scopolia lurida.
sinensis.

Scorpiurus vermiculata.

Scrophularia orientalis.
Scopoli.
Scorodonia.

Scutellaria altissima.
baicalensis.
indica var. japonica.
lateriflora.
orientalis.
Tourneforti.

Securigera Coronilla.

Sedum altissimum.
Ewersii.
maximum.
spathulifolium.
ternatum.

Selinum serbicum.

Senecio abrotanifolium.
adonidifolium.
alpinum.
Clivorum.
Doria.
Doronicum.
elegans.
Ledebouri.
Ligularia.
nemorensis.
squalidus.
stenocephalus.
suaveolens.
umbrosus.
Wilsoniana.

Serratula Gmelinii.
quinquefolia.
tinctoria.

Seseli elatum.
Libanotis.

Sesleria argentea.

Setaria glauca.
italica.

Sidalcea candida.
malvaeflora.
neo-mexicana.
spicata.

Siderites scordioides.

Siegesbeckia orientalis.

Silene alpestris.
Armeria.
asterias.
chloraefolia.
ciliata.
colorata.
conoidea.
echinata.
elegans.
Fortunei.
fruticulosa.
fuscata.
gigantea.
laeta.
linicola.
longicilia.
melandrioides.

Silene—*cont.*
Muscipula.
noctiflora.
nocturna.
Otites.
paradoxa.
pendula.
quadrifida.
Saxifraga.
sedoides.
squamigera.
tatarica.
tenuis.
verecunda.
Zawadskii.

Silphium Asteriscus.
integrifolium.
scaberrimum.
trifoliatum.

Silybum Marianum.

Sisymbrium strictissimum.

Specularia hybrida.
pentagonia.
perfoliata.
Speculum.

Sporobolus cryptandrus.

Stachys Alopecuros.
annua.
arenaria.
citrina.
graeca.
grandiflora.

Statice bellidifolia.
Gmelinii.
latifolia.
Suwarowii.
tatarica.

Steironema ciliatum.

Stipa Calamagrostis.
Lessingiana.
papposa.
spartea.
splendens.

Swertia longifolia.

Symphyandra Hofmanni.
pendula.
Wanneri.

Symphytum asperrimum.

Synthyris reniformis.

Telephium Imperati.

Tellima grandiflora.

Teucrium canadense.
flavum.
multiflorum.
Scorodonia.

Thalictrum angustifolium.
aquilegifolium.
calabricum.
corynellum.
dioicum.
Fendleri.
odoratum.
squarrosum.

Thermopsis fabacea.
lanceolata.
rhombifolia.

Thymus odoratissimus.

Tolpis coronopifolia.

Tragopogon balcanicus.
major.

Tricholepis furcata.

Trifolium alpestre.
badium.
elegans.
incarnatum.
Johnstoni.
Lupinaster.
medium.
ochroleucum.
pratense.
resupinatum.
rubens.
scabrum.
stellatum.

Trigonella caerulea.
corniculata.
cretica.
Foenum-graecum.
polycerata.
radiata.

Trollius altaicus.
americanus.
asiaticus.
Ledebouri.
sinensis.

Troximon grandiflorum.

Tulipa Batalini.
dasystemon.
Kaufmanniana.
linifolia.
stellata.

Tunica Saxifraga.

Ursinia pulchra.

Urtica pilulifera.

Valerianella Auricula.
coronata.
dentata.
Dioscoridis.
echinata.
eriocarpa.

Verbascum Blattaria.
Chaixii.
leianthum.
olympicum.
phoeniceum.

Verbena Aubletia.
bonariensis.
erinoides.

Verbesina encelioides.
helianthoides.

Veronica austriaca.
crassifolia.
gentianoides.
glauca.
grandis.
Guthriana.
incana.
longifolia.
monticola.
orientalis.
Ponae.
saxatilis.
spicata.
— var. hybrida.
virginica.

Vesicaria sinuata.
utriculata.

Vicia angustifolia.
atropurpurea.
calcarata.
canescens.
melanops.
Orobus.
pisiformis.
sicula.
sylvatica.
unijuga.
villosa.

Vincetoxicum fuscatum.

Viola cornuta.
gracilis.
lutea.
Nuttallii.
persicifolia.
Rothomagensis.

Volutarella Lippii.
muricata.

Xanthocephalum gymnospermoides.

Zygadenus elegans.

TREES AND SHRUBS.

Those marked with an asterisk were not grown at Kew.

Acanthopanax divaricatum.
sessiliflorum.

Acer circinatum.
Heldreichii.
macrophyllum.
nikoense.
Trautvetteri.

Alnus barbata.
cordifolia.
elliptica.
incana.
japonica.
nitida.
oregona.
orientalis.
sitchensis.
Spaethii.
tenuifolia.
viridis.

Amelanchier asiatica.

Berberis concinna.
Darwinii.
dictyophylla.
Hookeri.
polyantha.
Stapfiana.
Thunbergii.
umbellata.
Wilsonae.

Betula coerulea.
Ermani.
— var. nipponica.
fruticosa.
glandulosa.
humilis.
lenta.
lutea.
papyrifera.
populifolia.
pumila.

Bruckenthalia spiculifolia.

Buddleia albiflora.
japonica.
nivea.
variabilis.
— var. Veitchianus.

Caragana arborescens.
— var. Redowskii.
aurantiaca.
decorticans.

Carmichaelia australis.

Carya porcina.

Ceanothus integerrimus.
thyrsiflorus.
velutinus.

Cedrus atlantica var. glauca.

Celastrus articulatus.
flagellaris.

Celtis occidentalis.

Cephalotaxus drupacea.
Fortuni.
pedunculata.

Cercis Siliquastrum.

Cistus creticus
florentinus.
hirsutus.
laurifolius.
monspeliensis.
salvifolius.

Clematis coccinea.
Flammula.
fusca.
heracleaefolia.

Clematis—*cont.*
integrifolia.
mandshurica.
nutans.
Pseudo-flammula.

Colutea arborescens.
bullata.
cilicica.
istria.
longialata.
media.

Cornus candidissima
glabrata.
stricta.

Cotoneaster acuta.
affinis.
amoena.
applanata.
bacillaris.
bullata.
buxifolia.
Franchetii.
frigida.
horizontalis.
integerrima.
Lindleyi.
microphylla, var. glacialis.
multiflora.
Nummularia.
pannosa.
rotundifolia.
Simonsii.
thymifolia.
uniflora.

Crataegus altaica.
Azarolus.
Carrierei.
coccinea.
cordata.
Dippeliana.
durobrivensis.
flava.
foetida.
melanocarpa.
mexicana.
modesta.
mollis.
nigra.
orientalis.
Peckii.
praecox.
tanacetifolia.

Crataegus—*cont.*
tomentosa.
Vailiae.

*Cryptomeria japonica.

Cupressus Lawsoniana.
nootkatensis.
obtusa.
sempervirens.
thyoides.

Cydonia cathayensis.
Maulei.

Cytisus albus.
biflorus.
capitatus.
leucanthus.
nigricans.
praecox.
purgans.
scoparius var. Andreanus.
sessilifolius.

Daboëcia polifolia.

Decaisnea Fargesii.

Desmodium canadense.

Deutzia crenata.
scabra.
Sieboldiana.

Elaeagnus multiflora.
umbellata.

Eleutherococcus Henryi.
Simonii.

Erica scoparia.
stricta.

Escallonia pterocladon.

Euonymus americanus.
latifolius.
oxyphyllus.
planipes.

Exochorda Alberti.

Gaultheria Shallon.

Genista aethnensis.
germanica.
pilosa.
radiata.
tinctoria.
— var. elatior.
virgata.

Halesia hispida.
tetraptera.

Helianthemum alyssoides.
halimifolium.
polifolium.

Hippophaë rhamnoides.

Hydrangea aspera.
petiolaris.
vestita.

Hypericum Androsaemum.
Ascyron.
aureum.
Buckleii.
elatum.
patulum.
— var. Henryi.

Ilex opaca.
Sieboldii.
verticillata.

Indigofera Gerardiana.

Jasminum fruticans.
humile.

Juglans nigra.

Kalmia cuneata.

Leycesteria formosa.

Lonicera deflexicalyx.
dioica.
Henryi.
iberica.
involucrata.
Maackii.
orientalis.
segreziensis.
translucens.
Xylosteum.

Lupinus arboreus.

Lycium chinense var. carnosum
pallidum.

Lyonia ligustrina.

Menziesia globularis.

Myricaria germanica.

Neillia amurensis.
opulifolia.
Ramuleyi.

Nesaea salicifolia.

Ononis arragonensis.
fruticosa.

Paliurus australis.

Pernettya mucronata.

Petteria ramentacea.

Philadelphus Gordonianus.
latifolius.
Lewisii.
tomentosa.

*Picea rubra.

Platanus orientalis.

Potentilla fruticosa.

Prunus acida var. semperflorens.
Cuthbertii.

Ptelea Baldwinii.
trifoliata.

Pyrus americana.
crataegifolia.
Niedzwetzkyana.
prunifolia.
Ringo.
rotundifolia.
sambucifolia.
Schiedeckeri.
sikkimensis.

Rhamnus cathartica.
davuricus.
fallax.
Frangula.
Purshiana.

Rhododendron racemosum.

Rhodotypos kerrioides.

Ribes alpinum.
divaricatum.
pallidum.
pubescens.
rotundifolium.

*Rosa laxa.
pisocarpa.
rubrifolia.
sericea.

Rubus adenophorus.
biflorus var. quinqueflorus.
diversifolius.
flosculosus.
Giraldianus.
Kuntzeanus.
laciniatus.
lasiostylus.
nigro-baccus.
parvifolius.
pubescens.

Ruta graveolens.

Securinega fluggeoides.

Skimmia japonica.

Sophora viciifolia.

Spartium junceum.

Spiraea Aitchisoni.
brachybotrys.
bracteata.

Spiraea—*cont.*
canescens.
chamaedrifolia.
Lindleyi.
salicifolia.
stellipila.

Staphylea colchica.
Coulombieri.
pinnata.
trifolia.

Stranvaesia undulata.

Styrax japonicum.

Symphoricarpus Heyeri.
mollis.
racemosus.

Syringa pekinensis.

Taxus cuspidata.

Thuya orientalis.

*Tricuspidaria lanceolata.

Vaccinium corymbosum.
padifolium.

Viburnum cotinifolium.
dilatatum.
Lantana.
Opulus.
phlebotrichum.
pubescens.
Sargentii.

Zanthoxylum Bungei.

Zenobia speciosa.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX II.—1913.

NOTE.

IN the preface to the *Catalogue of the Library of the Royal Botanic Gardens*, which was issued as Volume III. of the *Additional Series* of the *Kew Bulletin*, it was stated that annual lists of future additions would be published in the *Bulletin*.

The present instalment contains the additions made to the Library by gift or purchase during the year 1912, with the exception of such current periodicals and annuals as continue sets already catalogued.

Like the Catalogue, the List is printed on one side of the page to allow of its being cut up. It is probable that many persons and institutions will make the Kew Catalogue the basis of their own, and will use the lists of additions to supply printed slips for fresh titles.

(29468—6a.) Wt. 212—78'. 1125. 5/13. D & S A

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX III.—1913.

NEW GARDEN PLANTS OF THE YEAR 1912.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it has been thought desirable to publish a complete list of them in the *Kew Bulletin* each year. The following list comprises all the new introductions recorded during 1912. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1912, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and well-marked varieties, hybrids, whether introduced or of garden origin, have been included where they have been described with formal botanical names. Mere cultural forms of well-known garden plants are omitted, for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviations used to indicate them, are as follows:—*Bees, Cat.*—Bees, Ltd. Catalogue of Hardy Plants. *B. K.*—Vaupel, Blühende

(30400—6a.) Wt. 212—780. 1125. 6/13. D & S. A

Kakteen. *B. M.*—Botanical Magazine. *B. M. H. N.*—Bulletin du Muséum d'Histoire Naturelle, Paris. *B. P.*—Bollettino del R. Orto Botanico di Palermo. *B. S. B. F.*—Bulletin de la Société Botanique de France. *B. T. O.*—Bullettino della R. Società Toscana di Orticultura. *Fedde, Repert.*—Fedde, Repertorium specierum novarum regni vegetabilis. *Gard.*—The Garden. *G. C.*—Gardeners' Chronicle. *Gfl.*—Gartenflora. *G. M.*—Gardeners' Magazine. *Jard.*—Le Jardin. *J. of H.*—Journal of Horticulture. *J. H. F.*—Journal de la Société Nationale d'Horticulture de France. *J. R. H. S.*—Journal of the Royal Horticultural Society. *K. B.*—Bulletin of Miscellaneous Information, Royal Botanic Gardens, Kew. *Lemoine, Cat.*—Lemoine, Catalogue. *M. D. G.*—Mitteilungen der Deutschen Dendrologischen Gesellschaft. *M. G. Z.*—Möllers Deutsche Gärtner - Zeitung. *M. K.*—Monatsschrift für Kakteenkunde. *N. B.*—Notizblatt des Königl. botanischen Gartens und Museums zu Dahlem bei Steglitz (Berlin). *N. B. G. Edinb.*—Notes from the Royal Botanic Garden, Edinburgh. *O. R.*—Orchid Review. *Orchis.*—Orchis. Beilage zur Gartenflora. *O. W.*—The Orchid World. *Pl. Wils.*—Plantae Wilsonianae, edited by C. S. Sargent. *R. H.*—Revue Horticole. *R. H. B.*—Revue de l'Horticulture Belge. *Sargent, T. & S.*—Sargent, Trees and Shrubs. *Späth, Cat.*—L. Späth, General Nursery Catalogue. *T. H.*—La Tribune Horticole. *Veitch, N. H. P.*—J. Veitch & Sons, New Hardy Plants from Western China.

The abbreviations in the descriptions of the plants are :—*diam.*—Diameter. *ft.*—Foot or Feet. *G.*—Greenhouse. *H.*—Hardy. *H. H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

Abies Douglasii Fletcheriana. *See* **Pseudotsuga.**

Abutilon Agnesae. (*B. P.* x. 129.) Malvaceae. G. An annual with rather large ovate-suborbicular leaves, deeply cordate at the base, and rather large yellow flowers borne singly on long axillary peduncles. Italian Somaliland. (Palermo B. G.)

Acanthopanax sessiliflorus var. **parviceps.** (*M. D. G.* 1912, 192.) Araliaceae. H. Distinguished from the type in being dwarfer, and in its denser more erect habit. North China. (Arnold Arboretum.)

Acer Wilsonii. (*Sargent, T. & S.* i. 157, t. 79 ; *G.C.* 1912, li. suppl. xix.) Sapindaceae. H. Leaves usually 3-lobed, 3–5 in. long, 3½–4 in. broad, membranous, dark yellowish - green above, lighter green below, glabrous except for tufts of whitish hairs in the axils of the secondary veins ; petioles slender, 1¼–2 in. long. Flowers in nodding glabrous panicles 2–2½ in. long. Fruit with broad wings spreading horizontally. Central China. (Hon. Vicary Gibbs ; Arnold Arboretum.)

***Aconitum Delavayi.** (*Bees, Cat.*, no. 36, 1912, 18.) Ranunculaceae. Flowers large, lavender-purple, produced later than those of the summer-flowering species and earlier than those of *A. autumnale*. Yunnan, China. (Bees, Ltd.)

Acriopsis Ridleyi. (*O. R.* 1912, 160.) Orchidaceae. S. Pseudobulbs broadly ovoid, compressed. Leaves linear, 3–4 in. long. Raceme lax-flowered. Sepals and petals yellow, sparingly spotted with crimson. Lip white with crimson lamellae on the claw ; lateral lobes small, oblong, obtuse ; middle lobe large, orbicular or transversely oblong. See *Hook f. Fl. Brit. Ind.* vi. 79. Singapore. (Sir Trevor Lawrence.)

Actinidia chinensis foemina. (*Veitch, N. H. P.* 1912, 9.) Ternstroemiaceae. H. The female form of the plant recorded in the list of 1903. The flowers are deeper-coloured than those of the male form. Central China. (J. Veitch & Sons.)

Adiantum cuneatum var. **micropinnulum.** (*G. C.* 1912, lii. 289, f. 129 ; *G. M.* 1912, 796.) Filices. S. Raised from the variety *gracillimum*. Young fronds tinted with rosy bronze, very much divided, the ultimate divisions being very small. (H. B. May & Sons.)

*Adiantum Siebertianum. (*G. C.* 1912, li. suppl. xv.; *G. M.* 1912, 637.) S. A new and attractive species, with curious elongated fronds. Australia. (F. Sander & Sons.)

*Aethionema amoenum. (*G.C.* 1912, lii. 199, f. 91.) Cruciferae. H. Similar in habit to *A. pulchellum*, but it has rather long leaves and much larger pale pink flowers. Armenia. (Kew.)

*Aethionema Kotschyi. (*G. C.* 1912, lii. 199.) H. A very dwarf plant, only 1 or 2 in. high, very free-flowering. Country not recorded. (Kew.)

*Akania Hillii. (*K. B.* 1912, 379; *B. M. t.* 8469.) Akaniaceae. G. This plant, which has been made the type of a new natural order allied to Sapindaceae, has been in cultivation for many years under the name of *Lomatia Bidwillii*, but did not flower till recently. It is a tree with unequally pinnate leaves having long narrow spiny-toothed leaflets, and long axillary panicles of white flowers. Petals 5, obovate-oblong, clawed, 4–5 lin. long Stamens usually 8. Australia. (Kew.)

*Alocasia colossea. (*G. M.* 1912, 637.) Araceae. S. Leaves large, cordate, light green; petiole pale creamy green. (F. Sander & Sons.)

*Alocasia Micholitziana. (*G. C.* 1912, li. suppl. xv., f. 9.) S. Leaves large, sagittate, waved at the margin, velvety, with a white midrib; petiole long. Malaya. (F. Sander & Sons.)

Aloe Riccobonii. (*B. P.* xi. 18, t. 1.) Liliaceae. G. Intermediate between *A. capitata* and *A. arborescens* and perhaps a hybrid between these species. (Palermo B. G.)

Aloe Steudneri. (*B. M.* t. 8448.) S. Leaves about 25, in a dense rosette 1 yd. across, about 2 ft. long, 5–6 in. broad at the base, with a somewhat rose-coloured toothed margin. Peduncles erect, simple or sparingly branched, nearly 3 ft. high; branches 6–10 in. long. Flowers about 2 in. long, over ½ in. broad; segments linear-oblong, the 3 outer deep red, the 3 inner rose-pink below, dark yellow at the tips, with red veins. Eritrea and Abyssinia. (Cambridge B. G., where it first flowered in 1901; Lady Hanbury, La Mortola.)

Amorphophallus Kerrii. (*K. B.* 1912, 43.) Araceae. S. Leaf solitary; petiole about 1 yd. long; blade trisect, with the ultimate segments lanceolate, acute, 6–8 in. long, 2–3 in. broad. Peduncle 10 in. long, olive-brown, with whitish-green spots. Spathe erect, lanceolate, concave, acute, 6–7 in. long, 2 in. broad, green, with whitish-green spots. Spadix much shorter than the spathe. Siam. (Trinity Coll. B. G., Dublin.)

Ampelopsis micans. (*M. D. G.* 1912, 188.) Ampelidaceae. H. The name proposed for the plant included in the list of 1908 as *Vitis repens*. A variety (*cinerea*), which differs from the type in having the leaves shortly hirsute on both sides and 5-lobed to or beyond the middle, is recognised. Central China. (J. Veitch & Sons; Arnold Arboretum.)

*Amygdalus praecox. (*G. C.* 1912, li. 175; *G. M.* 1912, 212 B.) Rosaceae. H. Garden hybrid between *A. persica magnifica* and *A. Davidiana alba*. (J. Veitch & Sons.) [*Prunus.*]

*Anemone demissa. (*G. C.* 1912, li. suppl. xv.) Ranunculaceae. H. Flowers small, white, borne in clusters, on scapes about 9 in. high. China. (Bees, Ltd.)

Angraecum Andersonii. (*K. B.* 1912, 134.) Orchidaceae. S. A leafless species with short subglobose flowers, which are semi-pellucid white, with a broad emerald-green line on the sepals, a green centre to the lip, and a green column. Gold Coast. (Glasnevin B. G.)

Anthericum Mandaianum. (*G. C.* 1912, li. suppl. xv.) Liliaceae. G. A dwarf-growing plant. Leaves dark green with prominent white midrib. (W. A. Manda, South Orange, New York.)

Aralia ? Lizei. (*R. H.* 1912, 568, f. 196.) Araliaceae. G.? An elegant plant with long-stalked leathery shining green rather deeply 5-lobed leaves; lobes acute, remotely toothed. It is supposed to be a hybrid between *Aralia Moseri* and the ivy. (Lizé frères, Nantes.)

Arenaria picta. (*G. C.* 1912, lii. 416.) Caryophyllaceae. H. "A pink-flowered species, resembling *Tunica Saxifraga*." Asia Minor and Syria. (Edinburgh B. G.)

Argemone mexicana × platyceras. (*R. H.* 1912, 277, f. 89 and col. t.) Papaveraceae. H. H. Several forms, differing in the colour and size of the flowers, have been produced by hybridising these species. (P. L. de Vilmorin, Verrières-le-Buisson, France.)

***Aristolochia heterophylla.** (*G. C.* 1912, li. suppl. xix., xx.) Aristolochiaceae. H. Flowers similar to those of the "Dutchman's Pipe," with yellow bent tube and 5 small chocolate-coloured segments. Western China. (Hon. Vicary Gibbs; J. Veitch & Sons.)

Armodorum siamense. (*Orchis*, 1912, 67, t. 13, ff. 9–18.) Orchidaceae. S. Similar to *A. labrosum* (*Renanthera bilinguis*), but the flowers are somewhat larger. Sepals and petals brown, with whitish transverse bands. Lip with brown side lobes and white middle lobe. Spur yellow. Column white. Siam. (Baron von Fürstenberg, Schloss Hugenpoet, Mintard, Germany.)

Aronia melanocarpa var. **elata.** (*M. D. G.* 1912, 186.) Rosaceae. H. Taller than the type with larger leaves, many-flowered corymbs, flowers more than 5 lin. across and larger fruits. South-Eastern United States. (Arnold Arboretum.)

Asparagus gracillimus. (*G. M.* 1912, 637.) Liliaceae. G. "A very light form of *A. plumosus*." (F. Sander & Sons.)

Asparagus erectus floribundus. See **A. Lutzii.**

Asparagus Lutzii. (*G. C.* 1912, lii. 427, f. 185.) G. Garden hybrid between *A. plumosus nanus* and *A. scandens deflexus*. (P. Lutz, Bingen-on-Rhine.) [Syn. *A. erectus floribundus*; R. H. 1912, 158, ff. 51–52. *A. plumosus* var. *Lutzii*; J. H. F. 1912, 699.]

Asparagus plumosus var. **nanus.** See **A. Lutzii.**

Asparagus zuluensis. (*K. B.* 1912, 283.) G. A glabrous climbing undershrub. Branches slender, straight, spreading. Cladodes very numerous, whorled, incurved, filiform, about ½ in. long, very thin. Flowers axillary, solitary, on pedicels ¼ in. long. Zululand. (Durban B. G.)

Asplenium divaricatum elegans. (*G. C.* 1912, lii. 433; *G. M.* 1912, 960, f.) Filices. S. A very graceful form, with the fronds divided into fine linear segments. (J. J. Parker & Co.)

***Aster likiangensis.** (*G. C.* 1912, li. 400.) Compositae. H. A small plant with deep blue flowerheads about 2 in. across on stalks 3 in. long. Yunnan, China. (Edinburgh B. G.)

Aster subcoeruleus Leichtlinii. (*Bees, Cat.* no. 36, 1912, 27.) H. Stems about twice as long as those of the type, with very much larger flowerheads. (Bees, Ltd.)

***Astrantia gracilis.** (*G. M.* 1912, 794.) Umbelliferae. H. Resembles *A. minor*, but the stems are shorter, only 9–10 in. high, and the leaves are larger and less finely divided. Flowers white with a creamy tinge. Austria. (S. Arnott.)

***Begonia Cuninghamei.** (*K. B.* 1912, 340.) Begoniaceae. G. Herb about 1¾ ft. high, with fibrous roots. Leaves obliquely elliptic-ovate, 5–6½ in. long. Cymes unisexual. Peduncle up to 5 in. long. Flowers white or more or less rose-tinted, the male with 2 broadly ovate segments about 5 lin. across, the female with 5 elliptic-oblong or ovate-elliptic segments up to about ½ in. long. Bolivia. (H. Clinton-Baker.)

***Begonia parva.** (*K. B.* 1912, 329.) S. Stems about 1 ft. long, clothed with stellate hairs. Leaves ovate, slightly unequally cordate at the base, about 4 in. long. Male flowers in forked cymes, deep rose; segments 4, the outer elliptic-oblong, the inner oblanceolate-oblong, all about ½ in. long. Female flowers solitary, deep rose; outer segments 2, elliptic-oblong, inner oblanceolate; all about ½ in. long. Congo State. (Brussels B. G.)

Begonia Sanderae. (*G. M.* 1912, 637.) G. Resembles *B. semperflorens gigantea*. Leaves red-tinged. Flowers neat, bright crimson-scarlet, in clusters. (F. Sander & Sons.)

***Berberis brevipaniculata.** (*Veitch, N. H. P.* 1912, 4, f.) Berberidaceae. H. A deciduous species forming a dense erect bush 4–6 ft. high. Stems bright red. Leaves obovate, deep green, in clusters of 4 to 7. Flowers pale yellow, in panicles. Berries bright rosy red. Western China. (J. Veitch & Sons.)

***Berberis candidula.** (*Gard.* (1912, 355.) H. The same as *B. Wallichiana pallida* of the 1904 list, not of Hook f. & Thoms.

***Berberis Coryi.** (*G. C.* 1912, lii. 321.) H. Apparently an evergreen. Leaves in clusters, spathulate, glaucous beneath. Berries round, currant-red, glaucous. China. (J. Veitch & Sons.)

***Berberis dictyophylla albicaulis.** (*Gard.* 1912, 332.) H. Appears to be of looser habit than the type; the leaves are whiter on the underside, and the stems are very glaucous. Western China. (Kew.)

***Berberis Giraldii.** (*G. C.* 1912, lii. 321, as *B. Geraldii.*) H. Berries very small, purplish-red, in very large branched clusters. China. (J. Veitch & Sons.)

Berberis koreana. (*M. D. G.* 1912, 184.) H. An ally of *B. Sieboldii* and remarkable for its almost globose coral-red shining fruits. Corea. (Arnold Arboretum.)

***Berberis Stapfiana.** (*K. B.* 1912, 35; *G. C.* 1912, lii. 288.) H. Similar to *B. Thunbergii*, but the growths are more erect and the leaves are not red-tinted. It is a dense spiny bush with deciduous cblanceolate entire leaves, racemose fascicles of yellow globose flowers, and coral- or currant-red berries borne in dense clusters. China. (M. L. de Vilmorin, Les Barres, France, &c.)

***Berberis Veitchii.** (*G. C.* 1912, lii. 321.) H. "A subevergreen with pendent clusters of numerous plum-purple oval glaucous berries." China. (J. Veitch & Sons.)

Bifrenaria Pickiana. (*Orchis*, 1912, 8, t. 1, ff. 1–7.) Orchidaceae. G. A small species, about 8 in. high. Pseudobulbs about the size of a hazelnut, 1-leaved. Leaves lanceolate, including petiole about 7 in. long and 1 in. broad. Flowers pale rose-red with a yellow crest on the lip, medium-sized. Colombia. (Herrenhausen Berggarten, Hanover.)

Brassia cyrtopetala. (*Orchis*, 1912, 118, t. 26, ff. 18–26.) Orchidaceae. G. Resembles in habit a smaller example of *B. Lanceana* from which it differs in the size of the parts of the flower and in the shape of the lip. Flowers medium-sized, yellowish, with a few large brown marks at the base of the sepals and petals, and a few brown-red dots on the lower half of the whitish-yellow lip. Colombia? (Baron von Fürstenberg, Schloss Hugenpoet, Mintard, Germany.)

Brasso-cattlaelia beardwoodensis. (*G. C.* 1912, li. 369.) Orchidaceae. G. Garden hybrid between *Laelio-cattleya Violetta* and *Brassavola Digbyana.* (Col. J. Rutherford.)

Brasso-cattleya Leonardi. (*O. W.* ii. 218.) Orchidaceae. S. Garden hybrid between *Brasso-laelia Helen* and *Cattleya Mossiae.* (C. Maron, Brunoy, France.)

Brasso-cattleya Rutherfordii. (*G. C.* 1912, li. 110.) S. Garden hybrid between *Cattleya Gaskelliana alba* and *B.-c. Queen Alexandra.* (Col. Rutherford.)

Brasso-cattleya Schillii. (*O. W.* ii. 218.) G. Garden hybrid between *B.-c. Digbyano-Mossiae* and *Cattleya Mossiae.* (Armstrong & Brown.)

Buddleia variabilis grandiflora. (*Lemoine, Cat.* 1912, n. 181, 5.) Loganiaceae. H. Flowers nearly 5 lin. across, dark lilac-mauve, with a golden eye. (V. Lemoine & Son, Nancy.)

Buddleia variabilis vars. **lilacina, perfecta** and **rosea.** (*G. M.* 1912, 822.) H. Forms differing in the colour of the flowers. (Hon. Vicary Gibbs.)

Bulbophyllum chlorostachys. (*Orchis*, 1912, 66, t. 13, ff. 1–8.) Orchidaceae. S. Pseudobulbs ovoid, 1–1¼ in. long, 1-leaved. Leaves ligulate, 7 in. long; petiole ¾ in. long. Scape erect about 8 in. long including the raceme. Raceme densely-flowered, cylindric, somewhat nodding. Flowers similar to those of *B. Careyanum*, but somewhat larger (about an inch long). Siam. (Baron von Fürstenberg, Schloss Hugenpoet, Mintard, Germany.)

Bulbophyllum congestum. (*K. B.* 1912, 131.) S. Allied to *B. odoratissimum* which it much resembles in habit, but the flowers are smaller, the sepals much shorter, and the lip pale yellow, not brown. Burma and South-West China. (Glasnevin B. G.)

Bulbophyllum pleiopterum. (*Orchis*, 1912, 114, t. 25, ff. 14–22.) S. Allied to *B. clavatum* and *B. conicum* and remarkable in having the rhachis of the inflorescence furnished with many short broad wings. Flowers rather small, half sunk in the rhachis. Madagascar. (Herrenhausen Berggarten, Hanover.)

***Cacalia calva.** (*M. G. Z.* 1912, 97, f.) Compositae. H.? Rootstock tuberous. Leaves basal, roundish in outline, up to 8 in. across, deeply cut into linear

lobes; petiole 10–12 in. long. Peduncle 18–20 in. high, bearing a few corymbosely arranged heads of small white tubular florets. Mexico. (Darmstadt B. G.)

*Calceolaria cana. (*B. M.* t. 8416.) Scrophulariaceae. H. H. A rather small perennial herb. Leaves in a basal tuft, oblong-lanceolate to obovate, 1¼–2¼ in. long, ⅜–¾ in. broad, entire or finely toothed, more or less densely white-woolly; petiole usually short. Scape slender, erect, including the loose cymose many-flowered inflorescence 1–1½ ft. long. Flowers violet-scented. Corolla white, suffused with rose or purple and more or less spotted with crimson or purple; upper lip small; lower lip nearly ½ in. long and ¼ in. broad. Chile. (Kew.)

*Calceolaria Forgetii. (*B. M.* t. 8436.) H. H. Undershrub, 1–1½ ft. high. Stems slender. Leaves ovate, ½–2¼ in. long, ⅓–1¾ in. broad, irregularly toothed, shortly pubescent above, nearly glabrous beneath; petiole ⅛–½ in. long. Panicle lax, many-flowered, 6–8 in. long. Corolla 4–5 lin. long, 2½–4 lin. broad, pale yellow, with a large reddish-brown blotch at the base of the lower lip; upper lip about 2 lin. long.; lower lip obovoid-globose, 3–4½ lin. long, erect and adpressed to the upper lip. Peru. (F. Sander & Sons.) [Syn. *C. virgata*; G. C. 1912, li. 50, f. 27, not of Ruiz & Pavon.]

*Calceolaria Veitchii. (*G. C.* 1912 li. suppl. xvi, f. 14; *G. M.* 1912, June 1, suppl. 5.) H. H. Garden hybrid between *C. alba* and a seedling from *Calceolaria Golden Queen*. (R. Veitch & Son.)

Calceolaria virgata. (*G. C.* 1912, li. 50, f. 27.) See C. Forgetii.

Callicarpa Giraldiana. (*M. D. G.* 366, ff.) Verbenaceae. H. A vigorous-growing plant, making annual shoots more than 6 ft. long, with unusually large elliptic-oblong toothed leaves. It is attractive in the autumn on account of its small coloured fruits which are produced in great profusion. Northern China. (H. A. Hesse, Weener, Hanover.)

*Camellia cuspidata. (*G. C.* 1912 li. 228, 262, f. 123.) Ternstroemiaceae. H. A floriferous pyramidal evergreen bush. Leaves narrow, 2-2½ in. long. Flowers single, white, 1½ in. across. Central China. (J. Veitch & Sons.) [= *Thea cuspidata*, Kochs.]

*Camellia japonica grandiflora. (*Gard.* 1912, 81, 82, f.; *J. of H.* 1912, lxiv. 146.) H. Flowers 5–7 in. across, white, with undulate and crinkled petals in a double row. Japan. (Kew.)

*Camellia japonica magnoliaeflora. (*J. of H.* 1912, lxiv. 146.) H. Petals 10–12, forming a more or less open tubular flower, pale fresh pink. Japan. (Kew.)

Camellia Tuckiana. (*G. C.* 1912, li. 208.) G. Flowers single, about 3 in. across, delicate pink, with numerous yellow stamens. (J. T. Bennett-Poë.)

*Campanula glomerata superba. (*M. G. Z.* 1912, 8, f.) Campanulaceae. H. A fine form with larger heads of deep violet flowers, obtained by crossing the dwarf variety and *C. glomerata dahurica*. (G. Arends, Ronsdorf, Germany.)

*Campanula stenocodon. (*G. C.* 1912, lii. 207.) H. Allied to *C. rotundifolia* which it resembles in habit, but it is more slender and has much narrower stem-leaves. Flowers long, narrow, tubular, rich lilac-purple. Maritime Alps. (C. Elliott.)

Cattleya amethystoglossa var. germignyensis. (*J. H. F.* 1912, 85.) Orchidaceae. G. A very vigorous variety with broad rose-white flowers very much spotted with carmine. (C. Thiébaux, Germigny-l'Evêque, Seine-et-Marne, France.)

Cattleya Anneliae. (*O. R.* 1912, 31.) G. Garden hybrid between *C. Parthenia* and *C. chocoensis alba*. (J. Ginot, St. Etienne, France.)

*Cattleya Blackii. (*G. C.* 1912, li. 61.) G. Garden hybrid between *C. Gaskelliana alba* and *C. Mendelii alba*. (Hassall & Co.)

Cattleya Brongniartii. (*R. H.* 1912, 244.) G. Garden hybrid between *C. Vigeriana* and *C. Percivaliana*. (C. Maron, Brunoy, France.)

Cattleya Mülleri. (*G. C.* 1912, lii. 356; *O. W.* iii. 56.) G. Garden hybrid between *C. Peetersiae* and *C. Harrisoniana alba*. (F. Sander & Sons.)

Cattleya nobilis. (*O. W.* ii. 268.) G. Garden hybrid between *C. granulosa* and *C. Warneri*. (F. Sander & Sons.)

Cattleya Seligerae. (*O. R.* 1912, 199.) G. Garden hybrid between *C. Whitei* and *C. Adonis*. (C. F. Karthaus, Potsdam, Berlin.)

Cattleya semontiana. (*J. H. F.* 1912, 706.) G. Garden hybrid between *C. Trianae alba* and *C. Hardyana alba*. (O. Doin, Dourdan, France.) [This name has also been given to a hybrid between *C. aurea* and *C. Gigas Sanderiana*, recorded in the list of 1902.]

Cattleya Trianae brunoyensis. (*R. H.* 1912, 6.) G. Sepals and petals mauve, the latter nearly 5 in. long and more than 3 in. broad. Lip of very fine shape, yellow at the throat, purple-violet at the base. (C. Maron & Son, Brunoy, France.)

Cattleya Trianae Cobbii. (*G. C.* 1912, li. 126.) G. A form with a dark line on the petals. (W. Cobb.)

Cattleya Warscewiczii Mandaiana. (*G. C.* 1912, li. 418; *O. W.* ii. 241.) G. Flowers a pure rose-red. (W. A. Manda, South Orange, New York.)

Celmisia spectabilis argentea. (*G. C.* 1912, li. suppl. xvi.; *G. M.* 1912, June 1, suppl. 5.) Compositae. H. Radical leaves lanceolate, entire, about 8 in. long, silky-tomentose above, densely felted beneath. Scapes tomentose, about 1 ft. high. Flower-head solitary, 3 in. across; ray-florets pure white; disc-florets yellow. New Zealand. (Bees, Ltd.)

Ceratolobus Forgetiana. See **Socratea Forgetiana.**

Cereus serratus. (*M. K.* 1912, 185.) Cactaceae, G. An erect plant with 3- or 4-angled branches; ribs regularly and narrowly crenate; spines yellow, needle-like, strong, up to about 7 lin. long, 7 radial and 2 central. Flowers showy, campanulate-funnelshaped, about 5 in. long; outer perianth-segments lanceolate, blood-red; inner elliptic, purple. Probably Guatemala. (F. de Laet, Contich, Belgium.)

***Cereus Silvestrii.** (*B. M.* t. 8426; *M. K.* 1912, 11; *M. G. Z.* 1912, 337, f.) G. Stems prostrate or the central one ascending, 1¼–4 in. long, 4–7 lin. thick, 8-angled; spine-cushions very closely set; spines 16–20 to a cushion, setaceous, 1 lin. long or less. Flowers brilliant orange-scarlet, funnelshaped; tube 1–1¼ in. long; segments lanceolate, spreading, ½–¾ in. long, 2 lin. broad. Argentina. (Haage & Schmidt, Erfurt.)

Cereus Vaupelii. (*M. K.* 1912, 106, 127.) G. A climbing species with rigid sparingly rooting branches setose at the apex; ribs 5; areolae small, tomentose; spines minute, scabrid; radial 2–5, often wanting; central 1 or 2. Flowers vanilla-scented, broadly funnelshaped, including ovary 10 in. long; outer segments linear, yellow; inner segments lanceolate, white. Hayti. (Dahlem B. G.; Haage & Schmidt, Erfurt.)

***Ceropegia Thorncroftii.** (*B. M.* t. 8458.) Asclepiadaceae. S. Roots thick and fleshy, in a cluster. Stem twining. Leaves somewhat fleshy, ovate or elliptic-ovate, 1–2¼ in. long, ½–1¾ in. broad, shortly petiolate. Cymes axillary, pedunculate, many-flowered. Corolla white, with purple blotches; tube 1 in. long, curved, inflated at the base, narrowly cylindric above; lobes linear-oblong, over ⅓ in. long, erect, then incurved, connate at the tips. Transvaal. (Cambridge B. G.)

Cheiranthus mutallio. (*R. H.* 1912, 211; *J. H. F.* 1912. 184.) Cruciferae. H. H. Garden hybrid between *C. mutabilis* and *Erysimum Allionii*. (Cayeux & Le Clerc, Paris.)

***Chironia laxa.** (*B. M.* t. 8455.) Gentianaceae. G. A glabrous herb with loosely branched stems 1-1½ ft. long. Leaves opposite, lanceolate, entire, ¾–1 in. long, 1–1½ lin. broad. Flowers showy, 1–3 on each branch. Peduncles ½–1¼ in. long. Corolla pale magenta; tube narrowly cylindric, half as long again as the calyx; lobes ovate-lanceolate, somewhat acuminate, 5–6 lin. long, 2–2½ lin. broad. Cape Colony. (Cambridge B. G.)

Chondrorhyncha Lipscombiae. (*K. B.* 1912, 133.) Orchidaceae. S. Allied to *C. albicans* from which it is distinguished by its longer leaves, larger flowers, and subtrilobed lip. Leaves up to 12 in. long. Flowers white, with some light purple veins on the lip. Sepals and petals ¾–1 in. long. Lip nearly 1 in. long and broad. Panama. (Mrs. Lipscomb.)

Chrysanthemum ochroleucum. (*M. G. Z.* 1912, 338, f.) Compositae. G. A glabrous undershrub with obovate-cuneate coarsely toothed leaves and pale yellow ray-florets. Lanzarote, Canary Islands. (O. Burchard, Puerto de Orotava, Tenerife.) [Syn. *Argyranthemum ochroleucum*, Webb.]

***Cineraria hybrida.** (*G. C.* 1912, li. 266; *G. M.* 1912, 337, f.) Compositae, G. Garden hybrid between

C. cruenta [*Senecio cruentus*] and *Senecio tussilaginis*. (J. Veitch & Sons.)

Cirrhopetalum Micholitzii. (*K. B.* 1912, 132.) Orchidaceae. S. Pseudobulbs ovoid or ovoid-oblong, up to 1 in. long, 1-leaved. Leaves oblong or lanceolate-oblong, 3–3½ in. long. Scapes slender, about 6 in. long. Umbels 8–12-flowered. Flowers about ¾ in. long. Lateral sepals deep yellow. Dorsal sepal and petals blotched with dark purple on a pale ground. Annam. (Glasnevin B.G.; Stuart Low & Co.)

Cirrhopetalum miniatum. (*G. C.* 1912. lii. 254, 271; *O. R.* 1912, 320.) S. Similar to *C. gracillimum* especially in its caudate almost thread-like lateral sepals, and in the strongly ciliate dorsal sepal and petals, but it differs in having vermilion-coloured flowers with the hairs of the dorsal sepal and of the petals yellow. Annam. (F. Sander & Sons.)

Citrus Bigaradia var **Fitaliae.** (*B. T. O.* 1912. 263.) Rutaceae. G. Possibly a natural hybrid. It is a moderately large tree with oblong-lanceolate leaves, fragrant flowers 1–1¼ in. across, and globose or slightly oblong fruits about 3 in. across, which have a reddish bitter pulp. (Istituto Agrario Castelnuovo, Italy.)

Clematis akebioides. (*Veitch, N. H. P.* 1912. 9.) Ranunculaceae. H. A deciduous climber. Leaves trifoliolate, pale green; leaflets trifid, coarsely serrate. Flowers small, pale yellow. China. (J. Veitch & Sons.)

Clematis Davidiana × Vitalba. (*Gard.* 1912, Aug. 17, x.) H. Garden hybrid. (Miss Jekyll.)

***Clematis Gourieana.** (*Veitch, N.H.P.* 1912, 9, as *C. Gouriana.*) H. A deciduous climber. Leaves of 5 stalked leaflets. Flowers small, cream-yellow, fragrant, in dense clusters. China, India, Ceylon and Malaya. (J. Veitch & Sons.)

Clematis splendens. (*Bees, Cat.* no. 36, 1912, 104.) H. Leaves resembling those of [illegible]. Flowers in crowded clusters, nodding, bell-shaped, straw-yellow tinged with green, aromatic. Western China. (Bees, Ltd.)

Cocculus variiformis. (*G. C.* 1912, lii. 402.) See **Sinomenium diversifolium.**

***Codonopsis Bulleyi.** (*J. of H.* 1912, lxiv. 237, f.). Campanulaceae. H. A small-growing species with a prostrate habit, silvery grey ovate leaves, and soft lavender-blue bell-shaped flowers. Western China. (Bees, Ltd.)

Coelogyne formosa. (*Orchis*, 1912, 112, t. 25, ff. 1–6.) Orchidaceae. S. A fine species differing from *C. speciosa* in the shape of the lip, which has entire undulate keels. Sepals flesh-coloured. Lip densely spotted with brown. Column white, marked with pale brown in front. Sumatra. (Baron von Fürstenberg, Schloss Hugenpoet, Mintard, Germany.)

***Corokia virgata.** (*B. M.* t. 8466.) Cornaceae. G. A new species differing from *C. Cotoneaster* in its slender straight branches, larger leaves, and in the scales at the base of the petals, which are divided almost to the base into a few narrow segments. New Zealand. (Kew.)

Corylopsis multiflora. (*G. C.* 1912, li. 160; *G. M.* 1912, 191 (f.), 213.) Hamamelidaceae. H. An elegant free-flowering shrub. Flowers small, yellowish-green, borne in pendulous catkin-like racemes, appearing before the leaves. China. (Miss Willmott.)

Cotoneaster ambigua. (*Pl. Wils.* i. 159.) Rosaceae. H. Distinguished from *C. acutifolia* by its generally ovate much less pubescent leaves and more densely pubescent calyx, and from *C. moupinensis* by its smaller leaves, inflorescences and flowers and its globose fruit. Western China. (J. Veitch & Sons; Arnold Arboretum.)

***Cotoneaster amoena.** (*G. C.* 1912, li. 2, f. 1; *Pl. Wils.* i. 165.) H. A new species allied to *C. Franchetii*, but distinguished by its dwarfer more compact habit, smaller leaves, and aristate sepals as long at the petals. It reaches a height of 3–5 ft. Fruits closely clustered, ovoid, dull red on the exposed side, yellowish on the other. Yunnan, China. (J. Veitch & Sons.)

Cotoneaster apiculata. (*Pl. Wils.* i. 156.) H. Shrub, up to about 6 ft. high, with stout spreading branches. Leaves deciduous, orbicular or orbicular-ovate, apiculate, rarely emarginate, 2–6 lin. long, 2–4½ lin. broad; petiole ½–1 lin. long. Flowers unknown. Fruits solitary, erect, globose, 3½–4 lin. thick, scarlet. Western China. (Arnold Arboretum.)

***Cotoneaster Dielsiana.** (*Pl. Wils.* i. 166.) H. This is the correct name for the plant included in the list of 1907 under the name of C. applanata. A form with larger and broader leaves and larger fruits has been distinguished as *C. Dielsiana* forma *major*. Central China. (J. Veitch & Sons.)

Cotoneaster Dielsiana var. **elegans.** (*Pl. Wils.* i. 166; *G. C.* 1912, lii. 289.) H. Differs from the typical form in its thinner but more persistent leaves and in its smaller pendulous brick or orange-red fruits. Western China. (Hon. Vicary Gibbs.)

***Cotoneaster divaricata.** (*Pl. Wils.* i. 157; *G. C.* 1912, lii. 182; *G. M.* 1912, 687.) H. A new species most nearly related to *C. Simonsii*, but easily distinguished by its smaller leaves, constantly fewer-flowered racemes, less acuminate sepals, and by its ovoid darker red fruits; it is very distinct in habit and general appearance. Western China. (Arnold Arboretum; Hon. Vicary Gibbs.)

Cotoneaster foveolata. (*Pl. Wils.* i. 162; *M. D. G.* 1912, 195.) H. Shrub, up to about 10 ft. high, with a somewhat spreading habit. Leaves deciduous, elliptic or elliptic-ovate, up to 2½ in. long and 1¼ in. broad. Corymbs 3–7 flowered. Flowers white, tinted with rose. Fruit globose, black. Central China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Cotoneaster Harroviana.** (*G. C.* 1912, li. 3; *Pl. Wils.* i. 173.) H. A new species somewhat resembling *C. pannosa*, but it is stronger-growing, with larger more coriaceous shining green leaves, which are finally glabrescent beneath, and larger cymes having more numerous flowers. It is a loosely-branched shrub, 6–7 ft. high; branchlets spreading-pendulous. Flowers pure white. Fruits rather small, ovoid, brilliant red. Yunnan, China. (J. Veitch & Sons.)

Cotoneaster obscura. (*Pl. Wils.* i. 161.) H. A very much-branched shrub, up to 10 ft. high. Leaves deciduous, usually elliptic-ovate, 1–1¾ in. long, 7–10 lin. broad; petiole 1–1½ lin. long. Flowers unknown. Fruits 3–5, in racemes terminating short lateral branches, ovoid-pyriform, 4 lin. long and broad, dark red. Western China. (J. Veitch & Sons.)

***Cotoneaster salicifolia** var. **rugosa.** (*G. C.* 1912, lii. 289; *G. M.* 1912, 796; *Pl. Wils.* i. 172.) H. A subevergreen shrub with weeping or pendulous branches. Leaves lanceolate about 2 in. long and ¾ in. broad, much wrinkled, downy beneath. Berries bright scarlet, globose, ¼ in. across, borne in clusters of 6 to 12 or more. Central China. (Hon. Vicary Gibbs.)

Cotoneaster Zabelii. (*G. C.* 1912, lii. 289; *G. M.* 1912, 815; *M. D. G.* 1912, 196.) H. A subevergreen shrub of vigorous habit. Leaves ovate, pointed, about 1½ in. long and ¾ in. broad, downy beneath. Berries dull crimson, rather large, flattened at the apex, borne in clusters of 3 to 9 or more on short spurs. Central China. (Hon. Vicary Gibbs; H. A. Hesse, Weener, Hanover.)

***Cotyledon procurva.** (*K. B.* 1912, 276.) Crassulaceae. G. Small, glabrous. Leaves narrowly cuneate, 1¼–1¾ in. long. Peduncle terminal, ¾–1¼ in. long. Flowers solitary or in twos or threes, subsessile. Corolla curved forward; tube cylindric, 5 lin. long, sordid purple; lobes lanceolate, about 2 lin. long, pale rose-purple. South Africa. (Kew.)

***Cotyledon racemosa.** (*G. C.* 1912, li. 348.) G. Plant 6–8 in. high, Main stem ⅔ in. thick, erect, branched in the upper part, leafless; branches densely leafy. Leaves sessile, linear-lanceolate or narrowly oblanceolate, acute, ¾–2 in. long, 2½–5 lin. broad. Peduncles terminal, solitary on each branch. Pedicels 2–5 lin. long. Flowers erect. Corolla 5-lobed; tube 4 lin. long, pale green; lobes broadly ovate, white, 3 lin. long. Stamens 10. South-west Africa. (Kew.)

***Cotyledon subrigida.** (*B. M.* t. 8445.) G. A handsome species nearest allied to *C. gibbiflora* among the Cotyledons in cultivation. Leaves about 18 in a rosette, oblanceolate or almost lanceolate, 4–6 in. long, 2–2½ in. broad, glaucous, with a red margin. Peduncles axillary, about 1½ ft. high. Pedicels up to ¾ in. long. Corolla ⅖ in. long, ⅗ in. broad, urn-shaped 5-angled, brilliant orange above, yellowish lower down. Mexico. (Washington B. G.; Kew.)

***Crassula Barklyi.** (*B. M.* t. 8421.) Crassulaceae. G. Stem 1–2 in. high, simple or branching at the base. Leaves opposite, closely imbricate, almost erect, connate at the base, the lower 2–3 lin. long, 6–7 lin. broad, the upper gradually smaller. Flowers nearly sessile in a dense terminal head. Corolla gamopetalous, deeply 5-lobed, white; lobes linear, 3 lin. long or more. Little Namaqualand. (Kew.)

*Crassula densa. (*K. B.* 1912, 275.) G. A very distinct species. Plant 1¾–2½ in. high, densely branched. Leaves crowded at the ends of the branches, subtrigonous, about ⅓ in. long. Peduncle terminal, 1¼ in. long. Flowers small, white, crowded in a head 5 lin. thick. South Africa. (Kew.)

*Crassula inamoena. (*K. B.* 1912, 275.) G. Related to *C. paniculata* from which it is distinguishable by its narrower subdistichous leaves, heeled at the base on the upper side and destitute of cilia. Flowers sessile, crowded in heads about ½ in. thick, white. South Africa. (Kew.)

*Cupressus formosensis. (*G. C.* 1912, li. 132, ff. 53 (2), 54.) Coniferae. H.? A very large tree, in a wild state sometimes reaching a height of 195 ft. with a stem 20 ft. in diam. It is closely allied to *C. pisifera*, but the growths are dull green on both sides or covered more or less on the under side with an irregularly diffused whitish bloom, the leaves are shortly, not long-mucronate, the cones are ellipsoid, and the oval seeds have narrow wings. Syn. *Chamaecyparis formosensis*, Matsumura. Formosa. (H. Clinton-Baker.)

Cyananthus Forrestii. (*G. C.* 1912, lii. 416; *N. B. G. Edinb.* v. 173.) Campanulaceae. H.? Plant 6–12 in. high. Stems ascending, branched, sparingly pilose. Leaves small, shortly stalked or sessile, obovate. Corolla cylindric, 7–10 lin. long, 2½ lin. broad, pale blue. Yunnan, China. (Edinburgh B. G.)

Cyclamen persicum Schwerinae. (*Gfl.* 1912, 119, f. 14.) Primulaceae. G. The name given to a race in which the corolla is broadly campanulate, resembling in shape that of *Convallaria majalis*. (F. Graf von Schwerin, Wendisch-Wilmersdorf, Germany.)

Cymbidium Schlegelii. (*G. C.* 1912, li. 62; *G. M.* 1912, 79, 87, f.) Orchidaceae. G. Garden hybrid between *C. insigne* and *C. Wiganianum*. (J. & A. A. McBean.)

*Cynoglossum coeruleum. (*G. C.* 1912, lii. 444, f. 189.) Boraginaceae. H.? Erect, neat in habit, 12–18 in. high. Leaves narrow, the longest about 3 in. long. Flowers bright blue, freely produced in panicled cymes. East Tropical Africa. (Barr & Sons.)

Cypripedium Arthurianum var Sanderae. (*O. R.* 1912, 29.) Orchidaceae. S. Garden hybrid between *C. Arthurianum* and *C. insigne Sanderae*. (W. R. Lee) [*Paphiopedilum.*]

Cypripedium auburnense. (*O. R.* 1912, 127.) S. Garden hybrid between *C. Euryades* and *C. Leeanum*. (J. J. Holden.) [*Paphiopedilum.*]

Cypripedium birkdalense. (*O. R.* 1912, 122.) S. Garden hybrid between *C. insigne Sanderae* and *C. Thalia magnificum*. (J. J. Holden.) [*Paphiopedilum.*]

Cypripedium caudatum Sanderae. (*G. C.* 1912, li. 29; *O. R.* 1912, 92.) S. A yellow-tinted form with very long drooping petals. (F. Sander & Sons.) [*Phragmopedilum.*]

Cypripedium Curto-phyllum. (*O. W.* ii. 122.) S. Garden hybrid between *C. Curtisii* and *C. glaucophyllum*. (H. T. Pitt.) [*Paphiopedilum.*]

Cypripedium Franchetii. (*O. R.* 1912, 358, f. 49.) H. Very similar to *C. macranthum*, differing chiefly in its more hairy foliage. Central and Western China. (Arnold Arboretum.)

Cypripedium Guillemetti. (*J. H. F.* 1912, 91.) S. Garden hybrid between *C. insigne* and *C. Spicerianum*. (Asile Saint-Maurice, Seine, France.) [*Paphiopedilum.*]

Cypripedium Hassallii. (*G. C.* 1912, lii. 202.) S. Garden hybrid between *C. bingleyense* and *C. Charlesworthii*. (Hassall & Co.) [*Paphiopedilum.*]

Cypripedium hortonense. (*G. C.* 1912, li. 369.) S. Garden hybrid between *C. Victor* and *C. Beeckmanii*. (F. A. Hindley.) [*Paphiopedilum.*]

Cypripedium viridissimum. (*G. C.* 1912, li. 14.) S. Garden hybrid between *C. villosum auriferum* and *C. aureum virginale*. (W. Shackleton.) [*Paphiopedilum.*]

*Daphne retusa. (*B. M.* t. 8430; *Veitch, N. H. P.* 1912, 4, f.) Thymelaeaceae. H. A dwarf evergreen shrub of compact habit. Leaves oblong-lanceolate, 1¼–3 in. long, ⅓–⅔ in. broad, coriaceous, glabrous, shining dark olive-green; petiole short, broad. Flowers umbellately arranged, fragrant, white shaded with rosy violet, rather more than ½ in. long. Western China. (J. Veitch & Sons.)

Daphne Thauma. (*G. C.* 1912, lii. 22, f. 9.) H. Natural hybrid between *D. rupestris* [*D. petraea*] and *D. striata*. Tyrol. (R. Farrer.)

Datura coccinea. See **D. De Noteri.**

Datura De Noteri. (*Jard.* 1912, 238.) Solanaceae. G. Supposed to be an annual. It grows about 3 ft. high and has brilliant red trumpet-shaped fragrant flowers produced in great profusion. South Africa. (R. de Noter, Bondy, Seine, France.) [Syn. *Datura coccinea*; J. H. F. 1912, 652.]

***Delphinium divaricatum.** (*R. H.* 1912, 512, f. 180.) Ranunculaceae. H. Closely allied to *D. Consolida*, but it is taller, much more branched, with extremely slender branches, and it has smaller but much more abundant flowers, which are produced over a longer period. Flowers bright reddish-violet, ¾ in. broad. Caucasus and Caspian Region. (Vilmorin-Andrieux & Co., Paris.)

Delphinium Purdomii. (*K. B.* 1912, 380.) H. Flowers blue, in a somewhat lax raceme. Posterior sepal broadly elliptic, acuminate, about 1 in. long and ¾ in. broad; other sepals much smaller; spur straight, ¾ in. long. Posterior petals 1¼ in. long, bifid at the apex; lateral up to 2½ lin. long. Kansu, China. (J. Veitch & Sons.)

***Dendrobium Dalhousieanum luteum.** (*G. C.* 1912. li. suppl. xxi.; *G. M.* 1912, June 1, suppl. 5.) Orchidaceae. S. "A very distinct form with sulphur-yellow tinted flowers and the usual crimson discs at the base of the lip." (Sir G. Holford.)

***Dendrobium Imthurnii.** (*K. B.* 1912, 131, 206; *B. M.* t. 8452.) S. A new species, probably the most robust of all the Dendrobiums in cultivation. Pseudobulbs 3–4½ ft. high, thick at the base, somewhat narrowed upwards, leafy. Leaves elliptic-oblong, 3–4 in. long, 1¾–2¼ in. broad. Racemes axillary, about 14 in. long, many-flowered. Flowers of medium size, white, with lilac streaks on the lateral lobes of the lip. New Hebrides. (Kew.)

Dendrobium monophyllum. (*O. R.* 1912, 208.) S. Somewhat like a *Bulbophyllum* in habit. Rhizomes stout, woody. Pseudobulbs oblong, 1 in. long or more, with 1 or 2 oblong leaves, 4–6 in. long. Racemes erect, rather 1-sided, with 9–15 greenish-yellow flowers nearly ½ in. long. Reintroduced; it was in cultivation in 1871. Queensland and New South Wales. (Sir J. Colman.)

Dendrobium rosellum. (*O. R.* 1912, 295.) S. Nearly allied to *D. Serra*, Lindl., but its flowers are larger and rose-coloured, not white, with a differently-shaped lip. Borneo. (Hon N. C. Rothschild.)

Dendrobium spurium. (*G. C.* 1912 li. 423.) S. A distinct and singular species. Stems slender at the base, thickened above, 9–12 in. high, bearing 2 or 3 terminal leaves. Flower solitary, about ¾ in. across, on a slender pedicel arising from one of the internodes below the leaves. Sepals and petals white. Lip with a narrow stalked base and broad orbicular front; sides incurved or cupped, yellowish, with pink veins and streaks. Syns. *D. euphlebium*, Rchb. f.; *Aërides spurium*, Lindl., etc. Singapore, Java, Borneo. (Hon. N. C. Rothschild.)

Dendrobium Wolterianum. (*Orchis*, 1912, 65, t. 12, ff. 17–24.) S. Stems cylindric, about 6 in. long, apparently 4–6-leaved. Raceme about ¾ in. long, densely many-flowered. Flowers rose-coloured. Sepals and petals about 2 in. long. Lip ½ in. long, very narrow. New Guinea. (P. Wolter, Magdeburg, Germany.)

***Deutzia crenata.** (*R. H.* 1912, 528.) Saxifragaceae. H. *D. crenata* var. *erecta* and *D. crenata* var. *formosa* are garden hybrids between *D. crenata candidissima* and *D. Vilmorinae*. (V. Lemoine & Son, Nancy.)

Deutzia grandiflora. (*M. D. G.* 1912, 185, without description.) H. Leaves ovate, up to 2 in. long, acute, denticulate, hoary and scabrid beneath; petiole ½ in. long. Peduncles terminal, 1–3-flowered. Calyx 3 lin. long, the tube hoary with stellate hairs. Petals erect-spreading, obovate, obtuse, about 7 lin. long. See *Bunge, Enum. Pl. China*, 30, and *Maxim. Rev. Hydrang. Asiae Or.* 30. Northern China. (Arnold Arboretum.)

***Deutzia Veitchii.** (*G. C.* 1912, li. suppl. xvi.; *Veitch, N. H. P.* 1912, 4, f.) H. Shrub about 3 ft. high. Leaves 3½ in. long, 1 in. broad, hispid, finely serrate. Corymbs terminal on short branchlets. Flowers rich deep rose in bud, bright rose when fully expanded, 1 in. across. Western China. (J. Veitch & Sons.)

Didymocarpus Veitchiana. (*N.B.G. Edinb.* v. 154.) Gesneraceae. G. Perennial herb, up to 8 in. high. Leaves in 2 to 4 pairs, ovate, unequally and shortly cordate at the base, serrate, up to 4 in. long and 2¼ in. broad; petiole up to 1¼ in. long. Cymes axillary, few-flowered. Corolla tubular, nearly 1¾ in. long, lilac, with about 16 longitudinal purple lines. Yunnan, China. (J. Veitch & Sons; Edinburgh B. G.)

Dieffenbachia Sanderae. (*G. M.* 1912, 637.) Araceae. S. Leaves very broad oval, green, mottled with cream-colour; petiole stem-clasping. (F. Sander & Sons.)

Diervilla hybrida styriaca. (*M.D.G.* 1912, 1, col. t., as *Diervillea.*) Caprifoliaceae. H. A seedling from a garden hybrid which is not indicated. It flowers very profusely. Corolla narrowly funnel-shaped, pale red, 1¼–1⅜ in. long. Syn. *Weigela styriaca*; M. G. Z. 1912, 296. (W. Klenert, jun., Graz.)

***Dombeya Calantha.** (*B. M.* t. 8424.) Sterculiaceae. S. An erect shrub, 11–12 ft. high. Leaves acuminately 3–5-lobed, about 12 in. across, coarsely toothed, cordate at the base, stellate-pubescent above, densely pubescent or tomentose beneath; petiole 8–9 in. long. Cymes corymbiform, about 15-flowered. Peduncles 6–8 in. long. Pedicels 1–1¼ in. long. Corolla rose-coloured, about 1½ in. across. British Central Africa. (Kew.)

Dombeya Davaei. (*R. H.* 1912, 177, ff. 56–57.) G. Garden hybrid between *D. spectabilis* and *D. natalensis.* A form differing in having pure white instead of rose-coloured flowers has been named *D. Davaei* var. *alba.* (Havre B. G.)

Dracaena Mandaiana. (*G. C.* 1912, li. suppl. xv.) Liliaceae. S. Leaves rose-coloured. (W. A. Manda, South Orange, New York.)

Dracaena perelegans. (*G. M.* 1912, 637.) S. Leaves long, narrow, recurving, coloured red, pink, and green. Solomon Islands. (F. Sander & Sons.)

Drimia oligosperma. (*K. B.* 1912, 363.) Liliaceae. G. A fine species having much branched inflorescences over 6 ft. high, and beautiful white star-shaped flowers which open late in the afternoon. Probably South Africa. (Glasnevin B. G.)

Echinocactus myriostigma var. **nuda.** (*M. K.* 1912, 136.) Cactaceae. G. Stem almost globose, shining olive-green, spineless and quite destitute of the tufts of wool found in the type. (R. Graessner, Perleberg, Germany.)

Echinocactus rafaëlensis. (*M. K.* 1912, 163.) G. A tufted species. Stem globose or cylindric-globose, bright green; apex somewhat depressed and sparingly clothed with whitish wool; ribs 13–20; radial spines 7–9, curved, up to about 1¼ in. long; central 1, longer. Flowers unknown. Seeds small, black. Mexico. (Darmstadt B. G.; R. Graessner, Perleberg, Germany.)

Echinocactus violaciflorus. (*M. K.* 1912, 102, f.) G. Stem simple, at first globose, then columnar, 2 in. high; ribs up to 35, deeply crenate; spines bent backwards, 3 linear-lanceolate, 1¼ in. long, up to 2½ lin. broad at the base, yellow with brown tips, 4 or 5 circinnate, subulate, 3½–6 lin. long, white. Flowers white with violet stripes, 1 in. long, 1¼ in. across. Mexico. (F. de Laet, Contich, Belgium.)

Echinocereus Weinbergii. (*M. K.* 1912, 83.) Cactaceae. G. Erect, scarcely tufted. Stem about 5 in. high, globose, finally conical; ribs 15, straight, at first incised; areolae very close together; spines 9–12, all radial, 1½–6 lin. long, finally yellowish. Flowers conical, rose-coloured, about 1½ in. across. North America, without precise locality. (Haage & Schmidt, Erfurt.)

Echinopsis minuscula. (*R. H.* 1912, 84, f. 25 and col. t.) Cactaceae. G. A very small free-flowering plant, globose, ¾–2½ in. across. Tubercles conical, short, arranged in 16–20 spiral series. Spines small, almost setaceous, whitish, varying from 10–30, according to the age of the plant. Flowers brilliant red, 1¼–1½ in. long and broad, arising on the lower tubercles. First introduced in 1887. Argentina. (Paris B. G.)

Echium truncatum. (*G. C.* 1912, li. 306, 368, f. 179; *G. M.* 1912, 376.) Boraginaceae. G. A garden name for *E. candicans.*

Epidendrum laterale. (*G. C.* 1912, lii. 202; *O. R.* 1912, 319.) Orchidaceae. G. Remarkable in having the inflorescence produced on a rudimentary pseudobulb as in *E. Stamfordianum.* Flowers not described. Central America. (J. J. Neale.)

Epidendrum Stallforthianum. (*G. C.* 1912, li. 114, f. 49.) G. A new species similar in habit to *E. nutans*, but it is distinguished from this and allied species by the rough rhachis of the panicle, rough ovaries and the characteristic flower-stalks. Inflorescence branching at the base, thereafter simple to the top. Sepals oblong, 5 lin. long, 1 lin. broad, dull brown. Petals filiform, pale brown. Lip about 5 lin. long, pale brown. Column ivory-white. The flowers have a peculiar and rather disagreeable odour. Mexico. (Stallforth, Wiesbaden.)

Epidendrum tripunctatum. (*O. R.* 1912, 208.) G. In cultivation in 1881 (included in the list, 1876–96), but lost. It has now been re-introduced. (S. Flory.)

Eria chrysobractea. (*Orchis*, 1912, 7, t. 1, ff. 8-15.) Orchidaceae. S. Stems cylindric, somewhat thickened from an attenuated base, about 6 in. long, usually 4-leaved. Leaves lanceolate-ligulate, up to 5 in. long and ¾ in. broad. Raceme 2–3-flowered. Bracts large, golden- or orange-yellow. Flowers medium-sized, snow-white, with a delicate purple-red border to the front of the lip. Siam. (Baron von Fürstenberg, Schloss Hugenpoet, Mintard, Germany.)

Eria Fletcheri. (*G. C.* 1912, lii. 476.) S. "A curious dwarf species with small spherical pseudobulbs, many of them bearing a single cream-white flower on a woolly stalk." Country not stated. (Sir Trevor Lawrence.)

Eriobotrya japonica var. **variegata.** (*G. C.* 1912, li. suppl. xv.) Rosaceae. G. Leaves variegated with irregular markings of pale green, dark green and white. (F. Sander & Sons.)

***Erodium olympicum.** (*G. C.* 1912, li. suppl. xv.; *Bees, Cat.* no. 36, 1912, 39.) Geraniaceae. H. Stock woody, producing bushy growths with finely cut shining silvery foliage and loose cymes of relatively large dog-rose pink flowers. Macedonia and Asia Minor. (Bees, Ltd.)

***Erodium Stephanianum.** (*G. C.* 1912, lii. 416.) H. Stem villous, branched. Leaves almost glabrous, bipinnatifid; lobes linear. Peduncles 2-5-flowered. Flowers dark purple. Petals scarcely longer than the sepals. See *DC. Prod.* i. 645. Eastern Asia. (Edinburgh B. G.)

***Euonymus sanguinea.** (*Veitch, N. H. P.* 1912, 9.) Celastraceae. H. A small deciduous tree. Leaves ovate, acuminate, finely serrate, 2–3 in. long, deep green, becoming purplish-crimson in autumn. China. (J. Veitch & Sons.)

***Fagus sylvatica Dawycki.** (*M. D. G.* 1912, 366, f., as *F. silvatica Dawycki.*) Cupuliferae. H. A fastigiate form included in the list of 1907 as *F. sylvatica var. fastigiata.*

Feroniella oblata. (*B. S. B. F.* 1912, 779, t. 18 and f. A.) Rutaceae. G. The type of a new genus belonging to the tribe Citreae and closely allied to *Feronia*, from which it chiefly differs in having twice as many stamens, and filaments furnished with basal appendages which are covered by woolly hairs. It is a small spiny tree with unequally pinnate leaves, paniculate inflorescences of white very fragrant flowers up to 1 in. across, and fruits resembling in size and shape those of the mandarin orange, having an edible subacid pulp and a woody or subwoody epicarp. Indo-China. (U. S. Dep. Agric., Washington.)

***Funkia Fortunei gigantea.** (*Bees, Cat.* no. 36, 1912, 41.) Liliaceae. H. Leaves and flowers much larger than in the type. (Bees, Ltd.)

Galanthus Elwesii poculiformis. (*G. C.* 1912, li. 33.) Amaryllidaceae. H. A very robust form, with large bell-shaped flowers, the inner segments of which are entirely pure white, similar to the outer. (R Farrer.)

Galega officinalis carnea fl. pl. (*Bees, Cat.* no. 36, 1912, 42.) Leguminosae. H. Flowers double, a pretty shade of bluish-rose. (Bees, Ltd.)

Gaultheria oppositifolia. (*G. C.* 1912, lii. 109, f. 43.) Ericaceae. G. An evergreen densely branched shrub. Leaves opposite or ternate, sessile, cordate, concave, bluntly and sometimes doubly toothed, 1½–2½ in. long. Inflorescence a terminal pyramidal many-flowered panicle 3–4 in. long and broad. Flowers white, urnshaped, ⅛ in. long. New Zealand. (T. Smith, Newry.)

***Gaultheria Veitchiana.** (*G. C.* 1912, lii. 188.) H. A shrub attaining a height of about 6 ft. Leaves obovate, obovate-lanceolate or almost oblong, ¾–4 in. long, ½–1½ in. broad, subcoriaceous, glabrous above, setose

beneath. Flowers in terminal or axillary racemes about 1½ in. long, or in panicles. Calyx-lobes deltoid, acuminate, nearly 1 lin. long, ½ lin. broad. Corolla white, otherwise as in *G. Hookeri* to which the species is closely allied. Western China. (J. Veitch & Sons.)

Gentiana gentilis. (*G. C.* 1912, lii. 416 ; *B. S. B. F.* xliii. 491.) Gentianaceae. H. An annual free-flowering species, with small cordate-ovate leaves, and sessile purple-blue flowers 1–1¼ in. long. Yunnan, China. (Edinburgh B. G.)

Gongora Tracyana. (*K. B.* 1912, 133.) Orchidaceae. S. Distinguished from *G. Scaphephorus* by having flowers only half the size and a lip with aristate lateral lobes. Sepals and petals greenish-yellow, barred and blotched with brown, the former about 7 lin. long. Lip ivory-white, with a few brown lines on the basal half, 4½ lin. long. Peru. (J. S. Bergheim ; Tracy's Nursery.)

***Haemanthus Andromeda.** (*Gard.* 1912, 437, 438, f.) Amaryllidaceae. G. Garden hybrid between *H. Katherinae* and *H. magnificus*. (C. G. van Tubergen, Jun., Zwanenburg, Haarlem.)

Haemanthus multiflorus var. **filiflorus.** (*B. T. O.* 1912, 275, t. 10.) G. Differs from the type in having narrower perianth-segments. Tropical Africa. (R. Scuola di Pomologia, Florence.) [= *H. filiflorus*, Hiern.]

Haplopappus scaposus. (*G. C.* 1912, lii. 478.) Compositae. H. An evergreen undershrub. Leaves obovate-oblong, long-attenuated at the base, acute, serrate. Flower-heads solitary, pedunculate. See *Gay, Fl. Chil.* iv. 50. Chili. (Edinburgh B. G.)

Helenium autumnale rubrum. (*G. C.* 1912, lii. 217 ; *G. M.* 1912, 722.) Compositae. H. Flower-heads deep red. (A. Perry.)

Helichrysum Selago. (*G. C.* 1912, lii. 478.) Compositae. H. H. A small much-branched shrub. Leaves closely appressed and imbricate or sometimes spreading, ovate-triangular, up to ⅛ in. long. Flower-heads solitary, terminal, sessile, ¼ in. across. See *Cheeseman, Man. N. Zeal. Fl.* 343. New Zealand. (Edinburgh B. G.)

***Heliconia insignis.** (*G. M.* 1912, 637.) Scitamineae. S. "With dark bronzy-green leaves." (F. Sander & Sons.)

Heuchera tiarelloides. (*R. H.* 1912, 528.) Saxifragaceae. H. Obtained by crossing the best forms of hybrid *Heucheras* with *Tiarella cordifolia*. (V. Lemoine & Son, Nancy.)

Hippeastrum Forgetii. (*J. R. H. S.* xxxviii. 73.) Amaryllidaceae. G. A new species allied to *H. pardinum*. Bulb rather small, with a neck 3 in. long. Leaves 6, appearing with the inflorescence, finally 2 ft. long and 1½ in. broad. Scape about 2 ft. high, 2-flowered. Pedicels 3 in. long. Flowers stellate, dull crimson or intensely dark red, green at the base, about 6 in. across ; outer segments slightly incurved at the tips, 4 in. long, 1 in. broad ; inner segments slightly shorter and narrower. Peru. (F. Sander & Sons ; A. Worsley.)

***Hydrangea aspera.** (*Veitch, N. H. P.* 1912, 9.) Saxifragaceae. H. A deciduous shrub, 2–3 ft. high. Leaves ovate, finely serrate, 6 in. long, rough. Corymbs roundish. Flowers pale mauve, the outer row only sterile. China. (J. Veitch & Sons.)

Hydrangea Bretschneideri sutchuenensis. (*G. C.* 1912, li. suppl. xix.) H. Leaves ovate-lanceolate, finely serrate, hairy on both sides. Fertile flowers cream white, surrounded by pure white sterile ones, in corymbs. Western China. (Miss Willmott.) [= *H. xanthoneura* var. *setschuenensis*, Rehd.]

***Hydrangea Sargentiana.** (*B. M.* t. 8447 ; *G. C.* 1912, li. suppl. xvi.) H. H. Shrub, 6–7 ft. high. Stems clothed with stiff erect scaly pale yellowish-green hairs. Leaves dark velvety green above, paler beneath, hairy on both sides ; blade ovate, 6–12 in. long, 3–7 in. broad ; petiole 3 in. long. Inflorescence up to nearly 1 ft. across, mostly of fertile flowers, with 8–10 pure white sterile ones about 1½ in. across. Stamens bluish. Central China. (Hon. Vicary Gibbs ; Kew.)

Hydrangea xanthoneura. (*M. D. G.* 1912, 185 ; *Veitch, N. H. P.* 1912, 10.) H. A very variable species closely allied to *H. Bretschneideri* from which it differs in the bark of the shoots of the previous year. This does not peel off and is often yellowish-grey or grey-brown. Three varieties are distinguished :—*lancifolia* (= *H. Bretschneideri* var. *lancifolia*), *setschuenensis* (= *H. Bretschneideri* var. *setschuenensis*) and *Wilsonii*. Central and Western China. (Arnold Arboretum ; J. Veitch & Sons.)

Hydrocotyle hirsuta. (*G. C.* 1912, lii. 478.) Umbelliferae. H. H. A hairy little plant with rather long creeping stems, small suborbicular shortly stalked leaves, and axillary spikes of whorled sessile flowers. San Domingo. (Edinburgh B. G.)

***Hypericum fragile.** (*Bees, Cat.* no. 36, 1912, 48.) Hypericaceae. H. Stems creeping, wiry, bearing very small leaves and very numerous rich golden flowers. Greece. (Bees, Ltd.)

Ilex corallina. (*R. H.* 1912, 512.) Aquifoliaceae. H. Branches long and slender. Leaves ovate-lanceolate, 4–5 in. long, 1¼–1¾ in. broad, finely denticulate, shining dark green above, paler beneath. Fruits numerous, small, coral-red. Central and Western China. (L. Chenault, Orleans.)

***Ilex Veitchii.** (*G. C.* 1912, lii. 289; *Veitch, N. H. P.* 1912, 4.) H. Very similar to *I. Pernyi*, but it is stronger in growth and its leaves are larger. Western China. (J. Veitch & Sons.)

Incarvillea brevipes. (*G. C.* 1912, li. suppl. xv.) Bignoniaceae. H. Included in list of 1909 under the name of *I. grandiflora* var. *brevipes*.

Indigofera reticulata. (*M. G. Z.* 1912, 271, f.) Leguminosae. H. Similar to *I. Kirilowi*, but it is dwarfer. Leaves a beautiful dark shining green. Flowers snow-white. China and Corea. (Darmstadt B. G.)

Ipomoea stans. (*M. G. Z.* 1912, 157, f.) Convolvulaceae. H. H. A non-climbing herbaceous species with a turnip-shaped white rootstock. It forms a dense broad bush up to about 1¾ ft. high. Leaves almost sessile, lanceolate or oblong, undulate-dentate, ¾–1¼ in. long, hirsute. Flowers axillary, long-stalked, funnelshaped-campanulate, about 3 in. across, azure-blue, with a purple sheen. Mexico. (Darmstadt B. G.)

Iris Clarkei x Douglasiana. (*G. C.* 1912, li. 274.) Iridaceae. H. Garden hybrid. (W. R. Dykes.)

***Iris Sintenisii.** (*G. C.* 1912, lii. 85.) H. Appears to be intermediate being *I. graminea* and *I. spuria*. Leaves in somewhat close tufts, almost linear, as long as the stem, glaucous green. Stem about 1 ft. long, with a single terminal head of 2 flowers. Falls with a small almost round blade separated by a narrow constriction from a long oval haft, closely veined with dark blue-purple on a white ground. Standards dark blue-purple. Black Sea Region and South-eastern Italy. (W. R. Dykes.)

***Ixora lutea.** (*B. M.* t. 8439.) Rubiaceae. S. This has been in cultivation for at least 20 years under the name of *I. coccinea* var. *lutea*. It differs from *I. coccinea* by the laxer inflorescence and the pale yellow flowers with ovate-rhomboid corolla-lobes. Garden origin. (Kew.)

***Jasminum Beesianum.** (*N. B. G. Edinb.* v. 253; *Bees, Cat.* no. 36, 1912, 98.) Oleaceae. H. Shrub 1–3 ft. high. Leaves simple, small, shortly petioled, ovate or lanceolate, ½–1 in. long, 2½–4 lin. broad. Flowers very fragrant. Calyx-lobes linear, 1½–2½ lin. long. Corolla pink or deep rose; tube about 5 lin. long; lobes erect or spreading, broadly elliptic or suborbicular, 2–2½ lin. long. Western China. (Bees, Ltd.)

***Kerstingiella geocarpa.** (*K. B.* 1912, 209, t.) Leguminosae. S. Cultivated in Togoland and other parts of Tropical Africa on account of its edible beans, which are ripened in the ground like those of *Arachis hypogaea* and *Voandzeia subterranea* to the latter of which the new genus is very closely allied. Leaves trifoliolate. Flowers small, in pairs or solitary, greenish-white. Mature pod up to about ¾ in. long, indehiscent, simple or consisting of 2 or 3 joints. Seeds oblong, about ¼ in. long. (Dahlem B. G.; Jena B. G.)

Laelia anceps Holmesii. (*O. R.* 1912, 91.) Orchidaceae. S. "A very fine variety of the *Chamberlainiana* type." (J. McCartney.)

***Laelia Gortonii.** (*O. R.* 1912, 142.) S. The name given to a plant of doubtful origin and of which the flowers are unknown. It is supposed to be Brazilian and to belong to the *L. crispilabia* group. The round pseudobulbs are about 1 in. long, and become furrowed after the first season, 1- or sometimes 2-leaved. Leaves lanceolate, 4–7 ins. long.

Laelia Johniana. (*Orchis*, 1912, 6, t. 1, ff. 22-30.) G. Pseudobulbs club-shaped, 3–4 in. long, 1-leaved. Leaves oblong-ligulate, about 5 in. long and 1½ in. broad. Raceme few-flowered. Flowers greenish-white, small for the genus. Sepals ligulate, about 1 in. long. Petals oblong-elliptic, broader than the sepals. Lip 3-lobed. Probably Colombia. (R. W. John, Andernach-on-Rhine.)

Laelia purpurata Schroederae. (*O. R.* 1912, 193.) S. Sepals and petals nearly white. Lip with some violet veins. (Baron B. Schröder.)

Laelio-cattleya amabilis. (*G. C.* 1912, li. 62; *G. M.* 1912, 87.) Orchidaceae. G. Garden hybrid between *L.-c. Fascinator* and *C. Luddemanniana Stanleyi.* (Charlesworth & Co.)

Laelio-cattleya Ethelae. (*O. R.* 1912, 31.) G. Garden hybrid between *L.c. corbeillensis* and *Cattleya bicolor.* (E. F. Clark.)

Laelio-cattleya Godmanii. (*G. C.* 1912, lii. 141; *G. M.* 1912, 650.) G. Garden hybrid between *Cattleya Iris* and *L.-c. callistoglossa.* (F. D. Godman.)

Laelio-cattleya Hastediana. (*G. C.* 1912, lii. 254; *G. M.* 1912, 753.) G. Garden hybrid between *Cattleya Dowiana aurea* and *L.-c. Greenwoodii.* (C. J. Phillips.)

Laelio-cattleya Hemptinnei. (*G. M.* 1912, 838.) G. Garden hybrid between *Cattleya Dowiana aurea* and *L.-c. rouselensis.* (Comte J. de Hemptienne, St. Denis, Ghent.)

Laelio-cattleya Henriettae. (*O. W.* ii. 218.) G. Garden hybrid between *L.-c. Greenwoodii* and *Cattleya Lueddemanniana.* (C. Maron, Brunoy, France.)

Laelio-cattleya lilacina. (*O. W.* iii. 30.) G. Garden hybrid between *Laelia Latona* and *Cattleya Pittiae.* (H. T. Pitt.)

Laelio-cattleya McBeaniana. (*G. C.* 1912, li. 229, 237, f. 107; *O. R.* 1912, 154.) G. Garden hybrid between *Laelia anceps Schroederiana* and *Cattleya Schroederae.* (J. & A. A. McBean.)

Laelio-cattleya Mossemiliana. (*G. C.* 1912, li. 18.) G. Garden hybrid between *Cattleya labiata* and *L.-c. bletchleyensis.* (C. F. Karthaus, Potsdam, Berlin.)

Laelio-cattleya rigida. (*O. W.* ii. 177.) G. Garden hybrid between *Cattleya Lawrenceana* and *Laelia superbiens.* (F. Sander & Sons.)

Laelio-cattleya rubiginosa. (*O. W.* iii. 5.) G. Garden hybrid between *Cattleya Schilleriana* and *Laelia Boothiana.* (H. T. Pitt.)

Laelio-cattleya Schwarziana. (*J. H. F.* 1912, 90.) G. Garden hybrid between *L.-c. bletchleyensis* and *Cattleya aurea.* (C. Schwarz, Ferrières-en-Brie, Seine-et-Marne, France.)

Laelio-cattleya Thurgoodiana. (*O. W.* ii. 85.) G. Garden hybrid between *L.-c. Martinettii* and *Cattleya Hardyana.* (H. T. Pitt.)

Laelio-cattleya venusta. (*O. W.* iii. 5.) G. Garden hybrid between *L.-c. Aphrodite* and *L.-c. Schilleriana* (F. Sander & Sons.)

Lastrea patens var. **Mayi.** (*G. C.* 1912, li. 386, f. 184; suppl. xvi.; *G. M.* 1912, June 1, suppl. 5.) Filices. G. Garden hybrid between *L. patens* and *L. lepida.* (H. B. May & Sons.) [*Nephrodium.*]

***Leea macropus.** (*G. M.* 1912, 637.) Ampelidaceae. S. "With broad leaflets." (F. Sander & Sons.)

Leptospermum scoparium var. **Boscawenii.** (*G. C.* 1912, li. suppl. xvi.; *R. H.* 1912, 520, col. t. f. B.) Myrtaceae. *G.* Flowers cherry-red in bud, rosy-white when expanded, 1 in. across. New Zealand. (Rev. A. T. Boscawen.)

***Leptospermum scoparium** var. **Nichollii.** (*G. C.* 1912, li. suppl. xv.; *B. M.* t. 8419; *R. H.* 1912, 520, col. t. f. A.) Included in the list of 1908 as *L. Nichollii.* The varietal name should be *Nichollsii.* See *G. C.* 1913, liii. 255.

***Lewisia Howellii.** (*G. C.* 1912, li. 349, f. 172; *G. M.* 1912, 376.) Portulaceae. H.H. or H. Leaves in a rosette, spathulate, crisped or undulate on the margins, 3–4 in. long, about ½ broad in the broadest part, thick and fleshy. Flowers in pedunculate subcorymbose cymes, 1 in. across, buff-yellow, streaked with crimson or pink. Western North America. (M. Prichard; Kew.)

Lilium davuricum var. **luteum.** (*G. C.* 1912, li. suppl. xvi., f. 13; *G. M.* 1912, June 1, suppl. 1.) Liliaceae. H. Flowers rich bright yellow, thickly spotted with reddish-brown inside. (A. Perry.)

Lilium Sargentiae. (*G. C.* 1912, li. 385.) H. A new species allied to *L. sul-*

phureum, but differing from this and others of the same group by the larger globose or ovoid acute purple bulb, densely leafy stem, oblong-lanceolate or ovate-lanceolate distinctly 3–7-nerved leaves bearing bulbils in their axils, waxy-white perianth red-purple outside, and pilose filaments. *L. Brownii* var. *leucanthum* in *Gard.* lxix. 234, with plate; *L. leucanthum*, Hort. Veitch. and *L. leucanthemum*, Hort. Farquhar. are recorded as being synonymous. See *G. C.* 1912, li. 404. Western China. (Farquhar & Co.)

***Lilium warleyense.** (*G. C.* 1912, lii. 15; *G. M.* 1912, 513 [f.], 534, 612.) H. A handsome species with a general resemblance to a fine form of *L. sutchuenense*. Stem about 4 ft. high, without bulbils. Leaves numerous, spirally arranged, linear, 3–5 in. long, about ⅛ in. broad. Flowers 20 or more, in an open cluster, pendulous on slender pedicels, about 3 in. across, orange-red, with prominent chocolate spots; segments recurved. China. (Miss Willmott.)

Lissochilus Grantii. (*O. R.* 1912, 322.) Orchidaceae. S. Allied to *L. Krebsii*, but the inflorescence is rather more compact and the flowers are smaller. Scape about 3 ft. high. Raceme 6 in. long, about 14-flowered. Flowers 1¼ in. across. Sepals brownish-green. Petals nearly orbicular, bright yellow behind, cream-yellow in front. Lip 3-lobed, light yellow; side lobes triangular-oblong, cream-coloured, with slate-coloured stripes below, tinged with brown above. British East Africa. (J. Bush.)

***Lithospermum Froebellii.** (*G. C.* 1912, li. 418; *G. M.* 1912, 487.) Boraginaceae. H. "A dwarf compact plant with Rosemary-like leaves and deep blue flowers on erect stems about 9 in. high." (R. Prichard.)

Lobelia taliensis. (*G. C.* 1912, lii. 416; *N. B. G. Edinb.* v. 170.) Campanulaceae. H. An erect plant 1–4 ft. high. Leaves narrowly obovate or obovate-oblong, 1¼–3 in. long, glabrous. Peduncle very short. Flowers blue, 1–1¼ in. long. Western China. (Edinburgh B. G.)

Lonicera Koehneana. (*Sargent, T. & S.* i. 41, t. 21; *Späth, Cat.* 1912–13, n. 154, 101.) Caprifoliaceae. H. Closely related to *L. chrysantha*, differing in the large connate bractlets, pubescent globose and larger ovaries, and the densely adpressed-pubescent corolla with a wide and strongly gibbous tube. Corolla 2-lipped, yellow, about 7 lin. long. China. (L. Späth, Berlin.)

***Lonicera prostrata.** (*Veitch, N. H. P.* 1912, 10.) H. A deciduous quick-growing scandent species. Leaves ovate, bright green on the young growths. Flowers small, pale cream. China. (J. Veitch & Sons.)

Lonicera Ruprechtiana var. **calvescens.** (*M. D. G.* 1912, 194.) H. Differs from the type in the leaves, which are almost glabrous except the hairy nerves on the under side. Amur Region. (Arnold Arboretum.)

***Lonicera Standishii lancifolia.** (*G. C.* 1912, li. 142.) H. Appears to be partly evergreen, and the leaves are narrower and more pointed than in the type. China. (Kew.)

Lonicera tatarica var. **pallens.** (*M. D. G.* 1912, 194.) H. Differs from other forms in the relatively small and narrow bluish leaves and in the small at first pale rose finally almost white flowers. Turkestan. (Arnold Arboretum.)

Lonicera Vilmorinii. (*M. D. G.* 1912, 194.) H. Garden hybrid between *L. deflexicalyx* and *L. quinquelocularis*. (M. L. de Vilmorin, Les Barres, France; Arnold Arboretum.)

Lotus mascaënsis. (*M. G. Z.* 1912, 253, f.) Leguminosae. G. Similar to *L. peliorhynchus* in vegetative characters, but it has a more compact bushy habit owing to the branches being much shorter. Flowers a pure shining canary-yellow, very freely produced. Western Tenerife. (O. Burchard, Puerto de Orotava, Tenerife.)

Lotus peliorhynchus atrococcineus. (*M. G. Z.* 1912, 3, f.) G. A form with dark red flowers. (Haage & Schmidt, Erfurt.)

Lowiara insignis. (*O. R.* 1912. 360.) Orchidaceae. G. Garden hybrid between *Sophronitis grandiflora* and *Brasso-laelia Helen.* (Stuart Low & Co.)

Lueddemannia Vyvereana. (*Orchis*, 1912, 113. t. 25, ff. 17–23.) Orchidaceae. S. Nearly allied to *L. Pescatorei*, but it has a differently-shaped lip with a longer claw, a smaller basal callus, and a less prominent thickening in the middle of the blade. Peru. (F. Sander & Sons.)

***Lupinus argenteus.** (*G. C.* 1912, li. suppl. xv.) Leguminosae. H. Leaves small, silvery. Racemes erect. Flowers rose-purple, with white on the standard. Western North America. (Bees, Ltd.)

Mammillaria collina. (*M. K.* 1912, 162.) Cactaceae. G. Stem simple, globose, up to about 5 in. across; apex somewhat depressed and clothed with white wool; tubercles cylindric, about 5 lin. long; axils woolly; radial spines 16–18, up to 2 lin. long, white; central 1 or 2, longer. Flowers rose-coloured, 7½–10 lin. long. Mexico. (Darmstadt B. G.; R. Graessner, Perleberg, Germany.)

Mammillaria dumetorum. (*M. K.* 1912, 149.) G. Tufted, proliferous from the base. Stems depressed-globose, finally cylindric-globose; tubercles conical, up to about 5 lin. long; radial spines numerous, bristle-like or awl-shaped, up to 3 lin. long or more, white, yellow at the base; central none. Flowers white with greenish-brown stripes, about ¾ in. long. Mexico. (Darmstadt B. G.)

***Mammillaria Kunzeana.** (*M. K.* 1912, 177, f.) G. Tufted. Stems at first globose, later subcylindric, 3 in. high, bright green; tubercles cylindric, about 7 lin. long; radial spines about 25, bristle-like, white, up to about ½ in. long; central 3 or 4, yellow or dark brown, larger than the radial. Flowers whitish or whitish-yellow, rose outside, ¾ in. long, 7 lin. across. Mexico. (L. Quehl, Halle-on-Saale, Germany.)

Mammillaria Mainiae. (*M. K.* 1912, 19, 144, f.) G. Stem simple or sparingly branched, semiglobose or ovoid, up to 4 in. high; tubercles cylindric, then conical, glaucous, yellow, 5–7 lin. long; radial spines 10–15, slender, yellowish, up to 5 lin. long; central 1 or 2, hooked, almost twice as long as the radial. Flowers numerous, funnel-shaped, ¾ in. long, up to 1 in. across; outer perianth-segments oblong, greenish-white; inner lanceolate, white with a rose-red median stripe. Mexico. (L. Quehl, Halle-on-Saale, Germany.)

Mammillaria napina. (*M. K.* 1912, 161.) G. Characterised by having a turnip-shaped root. Stem simple? semiglobose; tubercles conical; axils subwoolly or often naked; spines all radial, 12, white, yellow at the base, about 4 lin. long. Flowers pale crimson or rose-red. Mexico. (Darmstadt B. G.)

Mammillaria pilispina. (*M. K.* 1912, 150.) G. A tufted proliferous plant. Stems semiglobose, about 1¾ in. thick; tubercles cylindric, up to 5 lin. long; spines clothed with fine short hairs; radial partly very slender, curled, white, partly (4 or 5) thicker, subulate, spreading, about ¼ in. long, yellow at the base, white in the middle and brown at the apex; central 1, about ¼ in. long. Flowers and fruit unknown. Mexico. (Darmstadt B. G.)

Mammillaria radicantissima. (*M. K.* 1912, 164, f.) G. Remarkable for its yellowish carrot-shaped roots. Stem simple, subglobose; tubercles at first conical, then subrhomboid, very oblique, 5 lin. long; radial spines about 10, needle-like, white, up to 5 lin. long; central 1, longer and stouter. Flowers about ¾ lin. long; perianth-segments lanceolate, the outer yellowish, with darker median stripe, fringed, the inner pale-coloured, not fringed. Country not known. (F. de Laet, Contich, Belgium.)

Mammillaria Verhaertiana. (*M. K.* 1912, 152, f.) G. Stem simple, shortly cylindric, 3¾ in. high, 1¾ in. across; tubercles subconical, 3½ lin. long; areolae round-oval, very small; spines all horizontal, the radial 20 or more, up to 4 lin. long, the central 4 or 6, larger. Flowers whitish, funnel-shaped, about ¾ in. long and the same across. Probably Mexico. (F. de Laet, Contich, Belgium.)

Mammillaria viperina. (*M. K.* 1912, 148.) G. A tufted plant with cylindric decumbent stems 7–10 lin. thick; tubercles cylindric or globose, about 2½ lin. long; spines numerous, slender, rigid, up to about 2½ lin. long, variously coloured. Flowers and fruits unknown. Mexico. (Darmstadt B. G.)

Maxillaria Fürstenbergiana. (*Orchis*, 1912, 116, t. 25, ff. 1–9.) Orchidaceae. S. Habit similar to that of *M. ochroleuca*, but more robust. Flowers rather large, very freely produced, snow-white, with the anterior half of the sepals orange-yellow and the middle lobe of the lip red-bordered. Peru? (Baron von Fürstenberg, Schloss Hugenpoet, Mintard, Germany.)

Maxillaria Hennisiana. (*Orchis*, 1912, 117, t. 26, ff. 10–17.) S. Similar to *M. ochroleuca* but distinguishable by its broader distinctly stalked leaves, narrower sepals and petals, and by its lip. Its flowers are slightly smaller, yellowish-white, and fragrant. Pro-

bably Colombia. (Baron von Fürstenberg, Schloss Hugenpoet, Mintard, Germany.)

*Mertensia primuloides var. chitralensis. (*Bees, Cat.* no. 36, 1912, 60.) Boraginaceae. H. Flowers larger and more deeply coloured than in the type. Chitral State, N. W. India. (Bees, Ltd.)

*Mesembryanthemum decorum. (*G. C.* 1912, li. 403.) Ficoideae. G. A new species originally introduced about 40 years ago and figured in *B. M.* t. 6057 as *M. introrsum* (an error for *M. intonsum*). It was subsequently lost to cultivation and has now been re-introduced. The hairs on the tips of the leaves are white, and the petals rosy mauve, not as described in *B. M.* Cape Colony. (Kew.)

Mesembryanthemum Pearsoni. (*K. B.* 1912, 277; *B. M.* t. 8463.) G. A new species allied to *M. testiculare* from which it differs in having leaves nearly twice as large, the calyx exserted to about the level of the leaf-tips, and differently coloured flowers of which 2 or 3 of the inner series of petals are dull yellow, more or less streaked with purple, while the outermost series are entirely mauve-purple. Cape Colony. (Kew.)

*Micromeles Folgneri. (*M. G. Z.* 1912, 136, f.) Rosaceae. H. A small tree resembling *M. alnifolia*, but it is laxer in habit, with somewhat pendulous branches, and the leaves, which are covered on the under side with a silvery white indumentum, are smaller. Flowers white, in corymbose heads. Fruits yellow-red. Central China. (J. Veitch & Sons.)

Miltonia Phalaenopsis alba. (*O. W.* ii. 242, f.) Orchidaceae. S. Flowers pure white except for a bright yellow blotch and lineal markings on the lip. (Lager & Hurrell, New Jersey, U.S.A.)

Miltonia radiola. (*G. C.* 1912, li. 421.) S. "Flowers large, white, shaded purple, and heavily blotched with purple and yellow." (J. & A. A. McBean.)

Narcissus calathinus × minimus. (*G. C.* 1912, li. 175.) Amaryllidaceae. H. Garden hybrid. (Chapman.)

Nepenthes longicaudata. (*R. H.* 1912, 439.) Nepenthaceae. S. Garden hybrid between *N. Curtisii superba* and *N. Northiana pulchra*. (R. Jarry-Desloges, Remilly, Ardennes, France.)

Nephrolepis exaltata muscosa. (*G. C.* 1912, lii. 55; *G. M.* 1912, 571, 629, f.) Filices. S. A compact vigorous-growing variety with pale green fronds, which are not so finely divided as in others of the newer forms. (H. B. May & Sons.)

Nephrolepis exaltata Rochfordii. (*G. C.* 1912, lii. 15; *G. M.* 1912, 515 (f.), 535.) S. Similar to the variety *Marshallii compacta*, but the fronds are more finely divided and have a moss-like appearance. (T. Rochford & Sons.)

Nephrolepis exaltata Rooseveltii. (*G. C.* 1912, li. 91.) S. A striking form with undulate dark green pinnae. (H. B. May & Sons.) [Syn. *N. Rooseveltii*; G. C. 1912, li. 416.]

Nephrolepis exaltata Willmottae. (*G. C.* 1912, lii. 355.) S. A dwarf form closely resembling the variety *Marshallii*, but the fronds are more moss-like. (H. B. May & Sons.)

Nephrolepis Giatresii. (*G. C.* 1912, lii. 321; *M. G. Z.* 1912, 44, as *N. Giatrasi*.) S. A sport from *N. exaltata* var. *Scottii*, peculiarly compact in habit, with gracefully arching fronds scarcely more than 1 ft. long. (W. A. Manda, South Orange, New York.)

Nephrolepis Millsii. (*G. C.* 1912, lii. 321; *G. M.* 1912, 838.) S. Apparently a form of *N. exaltata* characterised by an open habit of growth (not dense and crested), with small finely crenate divisions of the fronds. (W. A. Manda, South Orange, New York.)

Nephrolepis Rooseveltii. See **N. exaltata Rooseveltii.**

Nephrolepis viridissima. (*G. C.* 1912, li. suppl. xv.) S. Fronds dark green, undulate. (W. A. Manda, South Orange, New York.)

Nephrolepis Wredei. (*M. G. Z.* 1912, 482, f. 1.) S. Derived from *N. exaltata Whitmanii*. It has broad pendulous deeply cut fronds. (E. Neubert, Wandsbek, Germany.)

Nymphaea formosa. (*G. C.* 1912, lii. 55.) Nymphaeaceae. H. Apparently of garden origin. Flowers 8 in. across, soft pink, becoming deeper at the base of the petals, pure yellow in the centre; inner petals pure yellow. (L. de Rothschild.)

Nymphaea gigantea var. **Hudsoniana.** (*G. C.* 1912, lii. 182.) S. Flowers large, round, blue, with broad petals and golden filaments. (L. de Rothschild.)

Odontioda chessingtonensis. (*O. R.* 1912, 136.) Orchidaceae. G. Garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum Rolfeae.* (R. G. Thwaites.)

Odontioda Rolfei. (*O. R.* 1912, 199 : *O. W.* ii. 219.) G. Garden hybrid between *Cochlioda vulcanica* and *Odontoglossum Hunnewellianum.* (R. G. Thwaites.)

Odontioda Sanderae. (*O. R.* 1912, 136.) G. Garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum percultum.* (R. G. Thwaites.)

Odontioda Schroederi. (*G. C.* 1912, li. 30 ; *O. R.* 1912, 57.) G. Garden hybrid between *O. Bradshawiae* and *Odontoglossum crispum.* (Charlesworth & Co.)

Odontoglossum Brayanum. (*G. C.* 1912, li. 161 ; *O. R.* 1912, 133.) Orchidaceae. G. Garden hybrid between *O. Groganiae* and *O. Harryanum.* (W. B. Hartland & Sons.)

Odontoglossum Collieri. (*G. C.* 1912, li. 92.) G. Garden hybrid between *O. Phoebe* and *O. ardentissimum.* (Sir J. Colman.)

Odontoglossum crispum Anami. (*O. R.* 1912, 90.) G. "A fine variety, with heavily blotched segments." (W. R. Lee.)

Odontoglossum Kilburneanum. (*O. W.* ii. 222.) G. Garden hybrid between *O. illustre* and *O. gandavense.* (C. J. Phillips.)

Odontoglossum Lambardeanum. (*O. W.* ii. 220, f.) G. Garden hybrid between *O. Vuylstekeae* and *O. coeruleum.* (C. J. Phillips.)

Odontoglossum nigrescens. (*G. C.* 1912, lii. 142 ; *O. R.* 1912, 279.) G. Garden hybrid between *O. Edwardii* and *O. cirrhosum.* (J. and A. A. McBean.)

Odontoglossum Palmeri. (*O. W.* ii. 159.) G. Garden hybrid between *O. crispo-Harryanum* and *O. Lambeauianum.* (T. W. Palmer.)

Odontoglossum Pescatorei Floryi. (*G. C.* 1912, li. 126.) G. Flowers "of good shape and with reddish spots on the inner parts of the segments." (S. Flory.)

Odontoglossum scintillans. (*O. R.* 1912, 349 ; *O. W.* iii. 55.) G. Garden hybrid between *O. Rossii rubescens* and *O. Wilckeanum princeps.* (W. Thompson.)

Odontoglossum Woodroffeae. (*G. C.* 1912, lii. 254 ; *G. M.* 1912, 752.) G. Garden hybrid between *O. Rossii rubescens* and *O. Queen Alexandra.* (E. H. Davidson.)

***Odontonia decora.** (*O. R.* 1912, 196.) Orchidaceae. G. Garden hybrid between *Miltonia Warscewiczii* and *Odontoglossum Adrianae.* (F. Sander & Sons.)

***Odontonia Firminii.** (*G. C.* 1912, li. 45 : *T. H.* 1912, 53 ; *O. R.* 1912, 287.) G. Garden hybrid supposed to be between *Odontoglossum crispum* and *Miltonia vexillaria* or *M. Phalaenopsis.* (F. Lambeau, Brussels.)

Odontonia ornata. (*O. R.* 1912, 196.) G. Garden hybrid between *Miltonia Warscewiczii* and *Odontoglossum Wilckeanum.* (F. Sander & Sons.)

Olearia Colensoi. (*G. C.* 1912, li. suppl. xviii.) Compositae. H. H. Leaves oblong-lanceolate, obtuse, 6 in. long, 3 in. broad, thick, coriaceous, at first densely white-tomentose on both sides, the older shining above. New Zealand ; Stewart Island. (Capt. A. A. Dorrien Smith.)

Olearia Cunninghamii. (*G. C.* 1912, li. suppl. xix.) H. H. Leaves obovate, slightly toothed, whitish beneath. New Zealand. (Capt. A. A. Dorrien Smith.)

***Olearia ferruginea.** (*G. C.* 1912, li. suppl. xix.) G. or H. H. Leaves ovate, 3½ in. long, 2 in. broad, covered on the under side, as well as the young wood, with a rust-coloured tomentum Australia. (Capt. A. A. Dorrien Smith.)

***Olearia semidentata.** (*G. C.* 1912, li. suppl. xviii.) H. H. A compact densely leafy bush. Leaves lanceolate, 2½–3 in. long, ½–¾ in. broad, serrate or serrulate near the tips, white-tomentose beneath. Flower-heads with purple ray- and violet disc-florets, or sometimes white. Chatham Islands. (Capt. A. A. Dorrien Smith.)

Olearia virgata lineata. (*G. C.* 1912, li. suppl. xviii.) H. H. Leaves very narrowly linear, 1–1½ in. long. New Zealand. (Capt. A. A. Dorrien Smith.)

Oncidioda cinnabarina. (*G. C.* 1912, lii. 476; *G. M.* 1912, 994.) Orchidaceae. G. Garden hybrid between *Cochlioda Noetzliana* and *Oncidium monachicum*. (Charlesworth & Co.)

Oncidioda Cooksoniae. (*O. R.* 1912, 272.) G. Garden hybrid between *Cochlioda Noetzliana* and *Oncidium macranthum*. (Mrs. Cookson.)

Onosma stellulatum var. **compactum.** (*M. G. Z.* 1912, 325, f.) Boraginaceae. H. Differs chiefly from the type in its more compact habit. (Bremen B. G.)

Ophrys etrusca and **O. Grampinii.** (*J. H. F.* 1912, 186.) Orchidaceae. G. Hybrids between *O. aranifera* and *O. tenthredinifera*, found in a wild state in Italy, and afterwards obtained by crossing the same species under cultivation. (L. F. Denis, Balaruc-les-Bains, France.)

Opuntia tomentilla. (*M. K.* 1912, 147.) Cactaceae. G. A remarkably free-flowering species, with obovate or obovate-oblong joints 8–12 in. long, 3¾–6 in. broad, bright green. Areolae about 1¼ in. apart, clothed with short blackish wool. Spines 1 or 2, slender, whitish, 3½–5 lin. long. Flowers 2–2½ in. long, bright red-yellow. See *M. K.* 1910, 81. Guatemala. (Lady Hanbury, La Mortola, Italy.)

***Oxalis enneaphylla** var. **rosea.** (*G. C.* 1912, li. suppl. xvi., f. 18; *G. M.* 1912, 424 & June 1, suppl. 6.) Geraniaceae. H. Flowers a soft rose-colour. (C. Elliott.)

***Oxytropis yunnanensis.** (*G. C.* 1912, li. 400.) Leguminosae. H. Stems many, woody. Leaves pilose, long-petiolate; leaflets in 8–11 pairs, lanceolate, 2½–3½ lin. long. Peduncles 3–5 in. long. Flowers 7–12 together in a rather dense head, deep blue, about 8 lin. long. See *Franchet, Pl. Delav.* 163. Yunnan, China. (Edinburgh B. G.)

Phalangium Bichei. (*M. G. Z.* 1912, 434, f.) Liliaceae. G. Appears to be the plant included in the list of 1902 as *Anthericum Bicheti*. (Haage & Schmidt, Erfurt.)

Phellodendron amurense × japonicum. (*M. D. G.* 1912, 361.) Rutaceae. H. Garden hybrid. (Lund B. G.)

Philadelphus sericanthus Rehderianus. (*M. D. G.* 1912, 196.) Saxifragaceae. H. Differs from the type in its larger leaves. Western China. (H. A. Hesse, Weener, Hanover.)

Philadelphus splendens. (*M. D. G.* 1912, 185.) H. Hybrid between *P. Gordonianus* and *P. grandiflorus*. (Arnold Arboretum.)

Phlox Arendsii. (*G. C.* 1912, lii. 15; *G. M.* 1912, 534.) Polemoniaceae. H. The name given to a strain said to have originated as hybrids from *P. canadensis* and *P. decussata*. (G. Arends, Ronsdorf, Germany.)

Phyllocactus Coopermannii. (*G. C.* 1912, li. 339; *G. M.* 1912, 425.) Cactaceae. G. Garden hybrid between *P. Cooperi* and *P. Ackermannii*. (A. Worsley.)

Physurus validus. (*K. B.* 1912, 134.) Orchidaceae. S. Allied to *P. rosea* and *P. bifalcis*. It has elliptic-lanceolate leaves about 5 in. long, a stout scape bearing an elongated dense spike about 6 in. long, and small whitish flowers. Peru. (Edinburgh B. G.)

Picea excelsa albo-spica. (*R. H.* 1912, 269.) Coniferae. H. Leaves on the young shoots yellowish-white. (P. V. Didier, Malzéville, Nancy.)

Picea excelsa falcata. (*M. D. G.* 1912, 363, f.) H. Peculiar in habit, the branches being sickle-shaped and curved upwards. (Lippe Palace-Garden, Detmold, Germany.)

***Pinguicula gypsicola.** (*M. G. Z.* 1912, 1, ff.; *G. C.* 1912, li. 58.) Lentibulariaceae. G. Leaves in a dense rosette, at first short and spathulate, afterwards long and lanceolate, becoming yellow-green with red tips, covered with white bristle-like hairs, glandular-hairy above. Flowers dark to light red-violet, with darker stripes and a white blotch on the lower lip, about 1½ in. across. Spur 1¼ in. long. Mexico. (Darmstadt B. G.)

Pleurothallis repens. (*K. B.* 1912, 131.) Orchidaceae. S. Rhizome creeping, slender. Secondary stems slender, 1–1¼ in. long. Leaves elliptic-oblong, 3-toothed at the apex, 1½–2 in

long. Peduncles 1-flowered. Flowers 6–7 lin. long, reddish-brown, with pallid sepals and petals striped with purple-red. South Brazil. (Sir F. Wigan.)

***Polygonum campanulatum.** (*G. C.* 1912, lii. 489, f. 212.) Polygonaceae. H. A bushy plant, 2-3 ft. high, with creeping rhizomes. Stems much branched. Leaves petiolate, elliptic, acuminate, green above, covered beneath with a fibrous brown tomentum. Flowers pink and white, in terminal cymes. The species belongs to the same section as *P. polystachyum* and *P. molle*. Himalaya of Eastern Nepal & Sikkim. (Miss Shaen.)

Polypodium irioides Bartelsi. (*G. M.* 1912, 637.) Filices. G. A form with much divided fronds. (F. Sander & Sons.)

***Polypodium Vidgenii.** (*G. C.* 1912, li. 387, f. 185; suppl. xvi.; *G. M.* 1912, June 1, suppl. 5.) G. Sterile fronds numerous, cinnamon-red, about a quarter as long as the fertile fronds, which are 2-3 ft. long, gracefully arched, bright pale green, with finely divided pinnae. Queensland. (H. B. May & Sons.)

Polystachya repens. (*K. B.* 1912, 132.) Orchidaceae. S. A very distinct species, extremely small, and remarkable for its creeping habit. Flowers only about ¼ in. long, with buff-yellow sepals and petals striped with brown, and deep red-brown lip. Uganda. (Sir Trevor Lawrence.)

Primula Beesiana × Bulleyana. (*G. C.* 1912, li. 368.) H. Garden hybrid. (Edinburgh B. G.)

Primula Fauriae. (*G. C.* 1912, li. 368, as *P. Faurei*.) H.? Leaves with golden farina below. Flowers rose-coloured, freely produced. Japan. (Edinburgh B. G.)

Primula Gillii. See **P. Wattii.**

***Primula Juliae.** (*G. C.* 1912, li. 228, 293, f. 142; *B. M.* t. 8468.) H. Tufted like the common primrose, producing from the main axis, after flowering, short runner-like shoots which root at the nodes. Leaves reniform-orbicular, cordate at the base, 1¼–2 in. long and broad; petiole slightly winged, about 3 in. long. Peduncles about 3 in. long. Flowers solitary, rosy purple, about the same size as those of the common primrose. Transcaucasia. (Kew; Oxford B. G.)

***Primula Knuthiana.** (*G. C.* 1912, li. 175, 190, 366, suppl. ill.; *G. M.* 1912, 212B, 253, 254, f.) H. A small-growing pretty species resembling in habit *P. farinosa frondosa*. Leaves slightly mealy. Flowers mauve or rosy lilac, in a somewhat crowded umbel. North China. (J. Veitch & Sons.)

***Primula malacoides alba.** (*G. C.* 1912, li. suppl. xv.) G. A white-flowered form. (Bees, Ltd.)

Primula malvacea. (*G. C.* 1912, li. 368.) H.? Allied to *P. cortusoides*. Flowers mauve, in 2 or 3 superposed umbels. Yunnan, China. (Edinburgh B. G.)

Primula membranifolia. (*G. C.* 1912, li. 368.) H.? Flowers violet. Yunnan, China. (Edinburgh B. G.)

***Primula patens.** (*R. H.* 1912, 489, f. 173.) H. Allied to *P. cortusoides*, differing chiefly in being larger in all its parts. Leaves elliptic, rounded at the apex, cordate at the base, 3¼–5 in. long, coarsely bidentate, hairy; petiole 5–6 in. long. Scape up to 1 ft. long bearing a 12–20-flowered umbel. Pedicels 1½ in. long. Calyx campanulate, 5-lobed almost to the middle; lobes lanceolate. Corolla lilac-rose except the slightly differently coloured eye; limb about 1 in. across; lobes deeply emarginate. Mandshuria. (P. L. de Vilmorin, Verrières-le-Buisson, France.)

Primula pseudocapitata. (*G. C.* 1912, lii. 416.) H.? Flowers in rotate capitula resembling *P. capitata*, but much smaller. Yunnan, China. (Edinburgh B. G.)

***Primula pulchelloides.** (*G. C.* 1912, li. 368.) H.? Nearly allied to *P. nivalis*. Flowers rather large, violet. China. (Edinburgh B. G.)

***Primula pycnoloba.** (*G. C.* 1912, lii. 160; *G. M.* 1912, 657.) H. Leaves resembling those of a *Megasea*. Flowers small, dark purple, with a large calyx. Western China. (J. Veitch & Sons.)

***Primula tibetica.** (*G. C.* 1912, li. 368.) H.? Allied to *P. involucrata*. It is a dwarf plant with rose flowers. Tibet. (Edinburgh B. G.)

***Primula uniflora.** (*G. C.* 1912, li. 407, f. 194.) H. A small plant. Leaves petiolate, small, ovate-lanceolate, deeply toothed. Peduncles 2–3 in. high, 1- or rarely 2-flowered. Corolla pale lilac or mauve; limb

nearly flat, about ¾ in. across. Probably no other *Primula* has flowers so large in comparison with the foliage. Sikkim Himalaya. (Kew.)

***Primula warleyensis.** (*G. C.* 1912, li. 228; *G. M.* 1912, 305.) H.? A provisional name for a small-growing species with green slightly serrate leaves about 1 in. long, and rather large mauve flowers in umbels about 2 in. high. China. (Miss Willmott.)

***Primula Wattii.** (*G. C.* 1912, li. 286, f. 138; *B. M.* t. 8456.) H.? A small plant with translucent green leaves covered with soft glandular hairs. Scape bronze-tinted, bearing an umbel of bell-shaped pendulous flowers, which are deep indigo in bud and later almost a royal purple shade outside and violet-blue and white within, with a broad white mealy eye. Eastern Sikkim. (Edinburgh B. G.; R. Gill & Son.) [Syn. *P. Gillii*; G. C. 1912, li. 227; Gard. 1912, 190, 202, f.]

Prunus gymnodonta. (*Pl. Wils.* i. 279.) Rosaceae. H. Cultivated as *P. triflora* from which it differs in the conduplicate leaves, which are partly or only slightly involute on the margin, glandless teeth of the leaves, very short pedicels, and in the smaller flowers. Mandshuria. (L. Späth, Berlin.)

Prunus lobulata. (*Pl. Wils.* i. 220; *M. D. G.* 1912, 196.) H. Tree, up to about 35 ft. high. Leaves rhombic or oblong-ovate, about 3¼ in. long and 1¾ in. broad; petiole 3½–7 lin. long. Flowers white. Fruits globose or globose-ovoid, about ½ in. long, red. Western China. (Arnold Arboretum; H. G. Hesse, Weener, Hanover.)

Prunus serrula var. **tibetica.** (*Pl. Wils.* i. 213; *M. D. G.* 1912, 196.) H. Tree, up to about 35 ft. high, with a dense head. Leaves lanceolate, long-acuminate, 1½–3½ in. long, ¼–1 in. broad. Umbels usually 3-flowered. Flowers white. Fruits ovoid or rounded-ovoid, about ½ in. long, red. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

Prunus tomentosa var. **endotricha.** (*Pl. Wils.* i. 225; *M. D. G.* 1912, 196.) H. Shrub or small tree. Leaves elliptic or oblong, 1–2 in. long, ½–1 in. broad; petiole 1–2 lin. long. Flowers white. Fruits 5–7 lin. long, 4½–6 lin. broad, dark red, sparingly pilose. Central China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

Prunus triflora var. **pubipes.** (*Pl. Wils.* i. 280.) H. Pedicels usually densely pubescent. Calyx-tube pubescent for a third or half of its length. Stamens 19–22 of which the larger are up to 1¾ lin. long. (Dahlem B. G.; L. Späth, Berlin.)

***Pseuderanthemum lilacinum.** (*B. M.* t. 8446.) Acanthaceae. S. Shrub, about 3 ft. high. Leaves lanceolate, long-acuminate, 4½–10 in. long, 1½–2¼ in. broad; petiole up to 1¾ in. long. Inflorescence paniculate. Corolla-tube narrow, straight, about 1½ in. long, almost white; limb 2-lipped, lilac-blue, with a white or yellowish blotch and numerous minute red specks on the mid-lobe of the lower lip, 1¼ in. across; upper lip 2 lobed; lower lip 3-lobed; lobes oblong. Malay Peninsula. (Kew.)

Pseudotsuga Douglasii Fletcheriana. (*G. C.* 1912, li. 190.) Coniferae. H. A very dwarf much-branched form. (Fletcher Bros.) [Syn. *Abies Douglasii Fletcheriana*; G. M. 1912, 253.]

Psilostrophe tagetina. (*G. C.* 1912, lii. 416. as *P. Tagetinae.*) Compositae. H. A low-growing woolly herb, with narrow often deeply toothed leaves, and numerous small yellow flower-heads arranged in corymbose clusters. Southern United States. (Edinburgh, B. G.) [Syn. *Riddellia tagetina*, Nutt. See *Gray, Syn. Fl.* ed. 2, i. pt. 2, 317.]

Pteris Gauthieri. (*Gfl.* 1912, 312, f. 34.) Filices. G. A form of *P. cretica* having the segments of the fronds more or less deeply lobed. (O. Bernstiel, Bornstedt, Potsdam, Berlin.)

Pteris Parkeri. (*G. C.* 1912, li. 160; *G. M.* 1912, 213.) S. A sporeling with an exact habit of growth, deep green fronds, and broad pinnae of stout texture. (J. J. Parker.)

***Pyrus Veitchiana.** (*G. C.* 1912, lii. 288; *G. M.* 1912, 796.) Rosaceae. H. A handsome tree with spreading branches. Leaves simple, broadly ovate, with finely toothed lobes. Berries dull crimson, about ½ in. across, freely produced in heavy clusters. China. (J. Veitch & Sons.)

***Rehmannia kewensis.** (*G. C.* 1912, li. 218, f. 97; *Gard.* 1912, 296, f.) Scrophulariaceae. G. Garden hybrid between *R. Henryi* and *R. glutinosa*. (Kew.)

Rhipsalis angustissima. (*B.M.H.N.* 1911, 470.) Cactaceae. S. Very much branched, pendulous. Articulations of the stem heteromorphous, the primary ones terete, elongated, the secondary ones short, narrow, leaflike, stalked, serrate, spirally arranged. Flowers lateral, whitish-rose, small. Berries scaly, white. Costa Rica. (R. Roland-Gosselin.)

***Rhododendron Delavayi album.** (*G. C.* 1912, li. 252.) Ericaceae. H.H. or H. Flowers pure white with small purple spots on the upper segments and a blotch of purple at the base of the corolla. Yunnan, China. (Kew.)

Rhododendron Fargesii. (*G. C.* 1912, li. 252.) H.? A bush 4–20 ft. high, resembling *R. campylocarpum* in foliage and in the shape of its flowers. Leaves ovate, cordate at the base, rounded at the apex, thin, glabrous and dull green above, glaucous beneath. Flowers in a fairly close head. Calyx almost obsolete. Corolla broadly campanulate, lavender-pink, with numerous small dull red spots on the upper part; lobes 6 or 7, not reflexed. Mountains of Szechuen, China. (P. D. Williams.)

***Rhododendron siderophyllum.** (*G. M.* 1912, 426.) H. Habit loose. Leaves narrow, 1–2 in. long, up to ¾ in. broad. Flowers similar in shape and size to those of *R. yunnanense*, but flesh-coloured, spotted with yellowish-brown. South-Western China. (J. Veitch & Sons.)

Ribes Berlandieri. (*Späth, Cat.* 1912–13, no. 154, 120.) Saxifragaceae. H. Hybrid between *R. cereum* and *R. inebrians*. (L. Späth, Berlin.)

Ribes glaciale. (*Bees, Cat.* no. 36, 1912, 100.) H. Flowers greenish-white with purple centre, produced in trusses all along the branches. Fruits bright scarlet and finally jet black. Yunnan, China. (Bees, Ltd.)

***Ribes laurifolium.** (*G. C.* 1912, li. 126; *G. M.* 1912, 171; *Gard.* 1912, 143, f.) H. Leaves rather broad, dark green. Racemes axillary, pendulous, small. Flowers greenish-yellow, each subtended by a strap-shaped yellowish-green bract. China. (Hon. Vicary Gibbs.)

Rodgersia pinnata superba. (*R. H.* 1912, 344; *J. H. F.* 1912, 320.) Saxifragaceae. H. Much finer than the type with the inflorescences more than 1¾ ft. long, raised well above the foliage. Flowers delicate rose. Fruits dark red. China. (M. L. de Vilmorin, Les Barres, Loiret, France.)

Rosa Giraldii. (*M. D. G.* 1912, 366.) Rosaceae. H. A vigorous-growing species, the young shoots reddish and densely covered with prickles, the old wood almost destitute of them. Flowers ¾–1¾ in. across, a beautiful rose-red, with white centre, in large loose inflorescences. Fruits oblong, scarlet, hanging a long time. Northern China. (H. A. Hesse, Weener, Hanover.)

Rosa omeiensis. (*B. M.* t. 8471.) H. A new species closely allied to *R. sericea*, differing in having more numerous and narrower leaflets, usually much smaller flowers, and thickened yellow fruiting pedicels. Leaflets 9–13, ⅓–¾ in. long, ⅓–¼ in. broad. Flowers solitary, white, over 1 in. across. Central China. (J. Veitch & Sons.)

***Roscoea cautleoides.** (*G. C.* 1912, li. suppl. xv. as *R. cautlioides*.) Scitamineae. H. Scapes about 9 in. high, each with a group of flowers at the apex. Flowers pale primrose-yellow, borne singly in the axils of sheathing bracts. Yunnan, China. (Bees, Ltd.)

***Rubus biflorus** var. **quinqueflorus.** (*G. C.* 1912, li. 148, f. 63.) Rosaceae. H. Very vigorous, sometimes 12 ft. high. Stems covered with a white waxy bloom; spines stiff, ½ in. long. Leaves pinnate, usually with 5 leaflets, green above, white beneath. Panicles terminal and axillary, usually 5-flowered. Flowers white, ¾ in. across. Fruits rich golden-yellow, of good flavour. Western China. (J. Veitch & Sons.)

***Rubus flosculosus.** (*G. C.* 1912, li. 166; *Späth, Cat.* 1912–13, n. 154, 123). H. An erect bush about 7 feet high. Stems dark brown, armed with stiff prickles ¼ in. long. Leaves pinnate, silvery-white beneath; leaflets 5, the terminal largest. Panicles about 12-flowered. Flowers small, pale purple. Fruits small, dark red. Central and Western China. (L. Späth, Berlin.)

***Rubus Giraldianus.** (*G. C.* 1912, lii. 448.) H. An elegant bush, 8–9 ft. high; stems white, branching in the upper half, terminating in graceful arched growths. Leaves pinnate North and Central China. (Kew.)

Rubus illecebrosus. (*Späth. Cat.* 1912–13, n. 154, 123.) H. A dwarf undershrub with pretty foliage. Flowers white, 1¾ in. across. Fruits attractive, scarlet. Japan? (L. Späth, Berlin.)

***Rubus niveus.** (*G. C.* 1912, li. 166.) H. Stems up to 12 ft. high, 3 in. in circumference at the base, thickly clothed with small spines and stiff brown hairs. Leaves pinnate; leaflets 3, large. Panicles terminal and axillary, up to 30-flowered. Flowers small, white. Fruits dull black, medium-sized. Central and Western China. (J. Veitch & Sons.)

***Rubus Swinhoii.** (*G. C.* 1912, li. 167, f. 69; *Veitch, N. H. P.* 1912, 10.) H Stems slender, up to 8 ft. high, dark green with a reddish tinge on the exposed side, armed with rather few short spines. Leaves simple, ovate, usually about 3 in. long and 1½ in. broad, serrate, dark green above, paler beneath. Panicles terminal, 5–7-flowered. Fruit black, rather bitter. China and Formosa. (J. Veitch & Sons.)

***Rubus tricolor.** (*G. C.* 1912, li. 167.) H. An earlier name for the species included in the list of 1910 as *R. polytrichus*.

***Rubus Wilsonii.** (*K. B.* 1912, 36.) H. Stems very prickly. Leaves pinnate, up to 6 in. long; leaflets 3 or 5, coarsely doubly serrate, glabrous above, sparingly prickly beneath: lateral unequally ovate; terminal broadly ovate or suborbicular, sometimes slightly 3-lobed. Flowers in short axillary and terminal fascicles. Petals purple, ⅓ in. long, erose on the margin. Central China. (J. Veitch & Sons.)

***Rupicola sprengelioides.** (*B. M.* t. 8438.) Epacridaceae. G. Shrub, 2½ ft. high, with twiggy branches. Leaves linear-lanceolate, ⅜–1 in. long, 1–1½ lin. broad, rigid. Flowers solitary, axillary, forming a raceme-like leafy inflorescence with a barren apex. Corolla subrotate, almost ½ in. across, milky white; segments ovate, 3 lin. long. Anthers orange-yellow. The genus is closely allied to *Epacris*. New South Wales. (Kew.)

Saccolabium fragans. (*O. R.* 1912, 229.) Orchidaceae. S. This was in cultivation in 1882 and is included in the list 1876–96, but appears to have been lost. It has now been re-introduced. Burma. (F. Peeters, Brussels.)

Saccolabium Fürstenbergianum. (*Orchis*, 1912, 68, t. 13, ff. 19–26.) S. Very closely allied to *S. trichromum*, but it has broader leaves, a branched inflorescence, and somewhat smaller flowers, which are rose-red with a paler spur and a white column. Siam. (Baron von Fürstenberg, Schloss Hugenpoet, Mintard, Germany.)

Saccolabium Regnieri. (*R. H.* 1912, 526.) S. A small plant with orange-coloured flowers in short racemes. Country not stated. (A. Régnier, Fontenay-sous-Bois, Seine, France.)

***Salix magnifica.** (*G. C.* 1912, li. suppl. xix.) Salicaceae. H. Remarkable for its very large obovate leaves. In young plants they are much smaller (about 6 in. long), with red midrib and petiole. China. (Hon. Vicary Gibbs.)

Salvia controversa. (*G. C.* 1912, lii. 478.) Labiatae. H. Leaves pinnatisect, bullate. Flowers small, blue. Mediterranean Region. (Edinburgh B. G.)

***Salvia flava** (*N. B. G. Edinb.* v. 235; *Bees, Cat.* no. 36, 1912, 78.) H. Plant 9–18 in. high. Basal leaves long-petioled, hastate-triangular or hastate-ovate, crenate or crenate-serrate, 1¾–6½ in. long, 1–3¼ in. broad, more or less pilose on both sides. Racemes of 4–8 subremote whorls. Whorls usually 4-flowered. Calyx pilose, 5–6 lin. long. Corolla canary yellow, with purple markings, about 2½ in. long; upper lip sparingly woolly. Western China. (Bees, Ltd.)

Salvia oaxacana. (*M. G. Z.* 1912, 565, f.) H. H. A shrubby densely leafy species, reaching a height of about 4 ft., with an erect bushy habit. Leaves shortly stalked, somewhat lanceolate, up to ¾ in. long, leathery, rugose, finely crenate, densely white-tomentose beneath. Flowers in a lax raceme, cardinal-red, nearly 1¾ in. long. Mexico. (Darmstadt B. G.)

Salvia superba. (*G. C.* 1912, lii. 15.) H. Garden hybrid between *S. turkestanica* and *S. Sclarea*. (B. Ladhams.)

***Salvia uliginosa.** (*R. H.* 1912, 468, f. 163.) H. H. A strongly aromatic herb,

with an abundance of rhizomes. Stems strong, often more than 5 ft. high, finely hirsute. Leaves lanceolate, acute, 3¼–5 in. long, ¾–1 in. broad, serrate, glabrous, dark green above, whitish beneath; petiole 1¼–1¾ in. long. Spikes terminal, interrupted, many-flowered, long-pedunculate, up to 1 ft. long. Calyx small, hirsute. Corolla about ¾ in. long; upper lip reduced; lower lip large, clear blue, with some white in the centre. Allied to *S. azurea*. Brazil and Uruguay. (L. Chenault, Orleans.)

Sansevieria Craigii. (*G. C.* 1912, li. suppl. xv.) Liliaceae. S. Leaves variegated. (W. A. Manda, South Orange, New York.)

***Saxifraga Aizoon Rex.** (*Gard.* 1912, 179.) Saxifragaceae. H. A handsome form with pure white flowers borne on carmine-red stems. (R. Farrer.)

***Saxifraga bathoniensis.** (*Gard.* 1912, 243.) H. A variety of *S. decipiens* with large scarlet-crimson flowers.

***Saxifraga Brunoniana** var. **majuscula.** (*N. B. G. Edinb.* v. 146.) H. Larger than the type. Stems 3–6½ in. long, 3–9-flowered. Basal leaves up to ¾ in. long, 1½–2½ lin. broad. Branches of the inflorescence 1¾–4 in. long. Yunnan, China. (Edinburgh B. G.) [Syn. *S. majuscula*: G. C. 1912, li. 400.]

***Saxifraga Burseriana elegans.** (*Gard.* 1912, 193, f.) H. Distinct in having bright rose-coloured buds and pale lilac flowers. (Kew.)

***Saxifraga cochlearis × lantoscana.** (*G. C.* 1912, li. 367, f. 178.) H. Garden hybrid. (Kew.)

Saxifraga diversifolia f. **foliata.** (*G. C.* 1912, li. 400; *N. B. G. Edinb.* v. 138.) H. Stems with 1 leaf or more, 3–20 flowered. Leaves cordate-ovate or cordate, glabrous or very shortly and densely glandular-pilose on the margin. Flowers golden-yellow. Sepals with the nerves mostly parallel. Yunnan, China. (Edinburgh B. G.)

***Saxifraga kewensis.** (*G. C.* 1912, li. 247, f. 112.) H. Garden hybrid between *S. Burseriana* var. *macrantha* and *S. Frederici-Augusti*. (Kew.)

Saxifraga majuscula. See **S. Brunoniana** var. **majuscula.**

Saxifraga turfosa. (*G. C.* 1912, lii. 416.) H. A yellow-flowered species allied to *S. diversifolia* and *S. parnassifolia*, but distinguished by its long stolons. Yunnan, China. (Edinburgh B. G.)

***Schomburgkia Lueddemani.** (*B. M.* t. 8427.) Orchidaceae. S. Pseudobulbs erect, fusiformly clavate, 6–10 in. long, often 2-leaved at the tip. Leaves arcuate, 8–14 in. long, 1¾–2 in. broad. Scapes erect, 1½–2 ft. long, many-flowered. Flowers of medium size, brown, with purple lip and column, yellow crest and anther. A reappearance; it was in cultivation in 1862. Venezuela. (Kew.)

Scolopendrium vulgare plumosum. (*R. H.* 1912, 414.) Filices. H. Believed to be a hybrid between the varieties *diversifrons* and *laceratum*. (H. Stansfield.)

Scrophularia aquatica var. **variegata.** (*J. H. F.* 1912, 493, 808.) Scrophulariaceae. H. Leaves with a broad white marginal band. (Vilmorin–Andrieux & Co.)

Sedum Adolphi. (*N. B.* v. 277.) Crassulaceae. G. Perennial. Flowering-stems, erect, robust, branched, glabrous. Leaves alternate, sessile, obovate-lanceolate or broadly obovate, ¾–1¼ in. long, 6–7 lin. broad, entire. Inflorescence corymb-like, rather dense, 1¼ in. long, 1¾ in. broad. Corolla glabrous, about ¼ in. long, divided nearly to the base into 5 ovate lanceolate segments aristate at the apex. Stamens 10. Mexico. (Dahlem B. G.)

***Sedum primuloides.** (*Bees, Cat.* no. 36, 1912, 287.) H. Rhizome thick, branched. Branches short, crowded. Leaves in terminal rosettes, rather long-petioled, broadly spathulate, 5–10 lin. long, including the petiole, 2½–3½ lin. broad in the middle. Peduncles short, 1-flowered. Petals white, broadly ovate, about ⅛ in. long. See *Journal de Botanique*, 1896, 84. Yunnan, China. (Bees, Ltd.)

***Sedum Woodwardii.** (*K. B.* 1912, 390.) H. Resembles *S. Aizoon*, but it has obliquely obovate obtusely toothed leaves and larger looser cymes. Flowers about ½ in. across, yellow. Country not definitely known, possibly China. (R. Woodward.)

Selenocypripedium Malhouitri. (*J. H. F.* 1912, 706.) Orchidaceae. S. Supposed to be a garden hybrid between *Cypripedium Harrisianum* and *Selenipedium Schlimii*. (E. Boullet, Corbie, Somme, France.)

***Sinomenium diversifolium.** (*G. C.* 1912. lii. 402, f. 178.) Menispermaceae. H. The name now adopted for the plant included in the list of 1910 as *Cocculus heterophyllus*. It is also in cultivation under the name of *Cocculus variiformis*.

Socratea Forgetiana. (*G. M.* 1912, 637, f.) Palmae. S. A distinct new species. Leaves rich green, at first entire and broadly rounded, later pinnate, with the terminal leaflet much larger than the others. Peru. (F. Sander & Sons.) (Syn. *Ceratolobus Forgetiana*; G. C. 1912, li. suppl. xv. f. 8.)

Sophro - cattleya westfieldensis. (*G. C.* 1912, lii. 476; *G. M.* 1912, 993.) Orchidaceae. G. Garden hybrid between *Cattleya labiata* and *S.-c. eximia*. (F. Wellesley.)

Spiraea japonica ovalifolia. (*M. D. G.* 1912, 196.) Rosaceae. H. Leaves ovate, dark green. Flowers white, in large corymbose inflorescences. Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Stanhopea peruviana.** (*B. M.* t. 8417.) Orchidaceae. S. A new species allied to *S. Wardii*, but its flowers are smaller with narrower petals, and the hypochile is much shortened and is not distinctly angled at the base. Leaves unusually broad and firm. Peru. (F. Sander & Sons; Kew.)

Stelis dolichopus. (*Orchis*, 1912, 63, t. 12, ff. 1–8.) Orchidaceae. S. Stems nearly 6 in. long, 1-leaved. Leaves rather thick, oblong-ligulate, up to nearly 4 in. long. Raceme only 1¼–1¾ in. long. Flowers pale yellow, 1¼ lin. across. Probably Colombia. (Dahlem B. G.)

Stelis Hennisiana. (*Orchis*, 1912, 64, t. 12, ff. 9–16.) S. Stems slender, up to 2½ in. long, 1-leaved. Leaves lanceolate-ligulate, about 3 in. long; petiole 1¼ in. long. Racemes slender, 1-sided, many-flowered, usually slightly longer than the leaves. Flowers dark purple-red, about 3½ lin. across. Colombia. (W. Hennis, Hildesheim, Germany.)

Stylidium articulatum. (*G. C.* 1912, lii. 416.) Stylidiaceae. G. Glabrous, except the glandular-pubescent inflorescence. Leaves in a rosette, oblong-spathulate, 2–4 in. long. Scape 6–18 in. high. Raceme or panicle dense, 2–4 in. long. Corolla rather large for the genus. See *Benth. Fl. Austral.* iv. 19. Western Australia. (Edinburgh B. G.)

***Styrax Wilsonii.** (*Pl. Wils.* i. 293; *B. M.* t. 8444.) Styraceae. H.? A new species differing from *S. japonica* by having all its parts about half the size and its leaves irregularly dentate. It produces flowers in a very young state—when only about 17 months old. Western China. (Arnold Arboretum; Kew.)

***Syringa Julianae.** (*K. B.* 1912, 37; *B. M.* t. 8423.) Oleaceae. H. Nearly allied to *S. pubescens*, but easily distinguished from it by its villous leaves, branchlets and inflorescence; the leaves of the flowering branches are smaller and more shortly stalked, and the flowers are smaller. Corolla-tube deep purplish-lilac outside; lobes nearly white inside. Western China. (J. Veitch & Sons.)

Syringa Meyeri. (*Pl. Wils.* i. 301.) H. Very closely allied to *S. pubescens*. It differs in the longer corolla-tube (about 8 lin. long), the minutely but distinctly puberulous branches, and in the different venation of the leaves. Northern China. (U.S. Dep. Agric.; Arnold Arboretum.)

Syringa reflexa. (*Pl. Wils.* i. 297; *M. D. G.* 1912, 196.) H. Remarkable for its long pendulous inflorescences. Leaves oblong-elliptic, about 4 in. long and 2 in. broad. Corolla violet; tube about ½ in. long; lobes scarcely spreading. Central China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Testudinaria paniculata.** (*K. B.* 1912, 195.) Dioscoreaceae. G. Cultivated for many years as *T. sylvatica*, but it is distinguished from this species by its curiously flattened, not dome-shaped, woody rhizome, the coriaceous subevergreen 10–13-nerved leaves, and the larger short-tubed rotate flowers, which are arranged in large axillary panicles. South Africa. (Kew.)

Thecostele Zollingeri. (*G. C.* 1912, lii. 42.) Orchidaceae. S. Resembles in growth and inflorescence a *Gongora* or an *Acriopsis*. Scape pendulous, about 9 in. long. Flowers numerous, pretty, over ½ in. across. Sepals and narrowly linear petals

white, spotted with crimson. Lip yellowish, bilobed, glandular, with a pink pubescent front. Lower Burma and Malay Archipelago. (Hon. N. C. Rothschild.)

Tilia Spaethii. (*Späth Cat.* 1912–13, n. 154, 134.) Tiliaceae. H. Garden hybrid between *T. americana* and *T. cordata*. (L. Späth, Berlin.)

***Trevesia Sanderi.** (*G. C.* 1912, li. suppl. xv.; *G. M.* 1912, 637; *Jard.* 1912, 260, f. 133.) Araliaceae. S. An *Aralia*-like plant, with handsome deeply cut leaves borne on long cylindrical petioles; leaf-blade nearly circular in outline, 2 ft. across, with 5 deeply and curiously incised lobes. Annam. (F. Sander & Sons.)

Tritoma Besteri. (*R. H.* 1912, 390; *J. H. F.* 1912, 448.) Liliaceae. H.? Scapes strong, attaining a height of 2¾ ft. Spikes rather short, ovoid. Flowers about 2 in. long, orange-red when young, afterwards canary-yellow with the tips of the lobes almost white. Stamens black, slightly exserted. The species resembles *Kniphofia Macowani* in habit and size. Country not stated. (Vilmorin-Andrieux & Co., Paris.) [*Kniphofia.*]

Tritoma hybrida mirabilis. (*M. G. Z.* 1912, 566, f.) H.? A race of garden hybrids with variously coloured flowers ranging from pale citron-yellow to orange-scarlet, remarkable in flowering within a year of the seedling stage. (Haage & Schmidt, Erfurt.) [*Kniphofia.*]

Ulmus campestris haarlemensis. (*M. D. G.* 1912, 366.) Urticaceae. H. A form of rather slow growth, with a dense broad pyramidal head. Leaves shining dark green, persisting 2 or 3 weeks longer than in the typical form. (L. Springer, Haarlem.)

Vanda coerulea albens. (*O. W.* iii. 49.) Orchidaceae. S. Sepals and petals pure white, with a very slight tinge of reddish-purple at their tips. Lip coloured as in the typical form. (A. Gunn.)

Vanda coerulea albidula. (*O. R.* 1912, 31.) S. Flowers white with some blue veining on the lip. (O. O. Wrigley.)

Vanda coerula blenheimensis. (*G. C.* 1912, lii. 218.) S. Flowers closely veined with pure blue on a white ground. (Duke of Marlborough.)

***Verbesina Purpusi.** (*M. G. Z.* 1912, 435, f.) Compositae. H.? A dwarf plant. Leaves in a rosette, elliptic, 4–5 in. long, crenate, rugose, with a broad pale midrib. Scapes 8–12 in. long, each bearing a solitary flower-head 1¾–2 in. across. Ray-florets deep golden. The flower-heads resemble those of *Arnica montana*. Mexico. (Darmstadt B. G.)

***Veronica cinerea.** (*G. C.* 1912, lii. 227.) Scrophulariaceae. H. A low-growing plant producing a mat of grey leaves. Flowers violet-blue or probably sometimes white, in small spikes. Asia Minor. (S. Arnott.)

Veronica coriacea. (*Bees, Cat.* no. 36, 1912, 94.) H. Leaves leathery, persistent, dark green. Flowers fringed, "lavender-red," in slender spikes. Western China. (Bees, Ltd.)

***Veronica pirolaeformis.** (*G. C.* 1912, li. suppl. xv. as *V. pyrolaeformis.*) H. A little plant with ovate-spathulate sessile leaves and erect spikes of bluish-white flowers. China. (Bees, Ltd.)

***Veronica surculosa.** (*Bees, Cat.* no. 36, 1912, 94, as *V. merculosa.*) H. "A quick-growing hardy alpine with attractive downy foliage and heads of white flowers, set off with a prominent red ring in the centre." Cilicia, Asia Minor. (Bees, Ltd.)

Viburnum alnifolium praecox. (*M. D. G.* 1912, 371, f.) Caprifoliaceae. H. The flowers of this appear 4 weeks earlier than those of the typical form. (H. A. Hesse, Weener, Hanover.)

***Viburnum ichangense.** (*Pl. Wils.* i. 115; *M. D. G.* 1912, 196.) H. Shrub with erect slender branches. Leaves thin, oval to oval-lanceolate, up to 2½ in. long and 1¼ in. broad, yellowish-grey and slightly pubescent above, more pubescent beneath. Flowers yellowish-white, in inflorescences ¾–1¾ in. across. Central China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

***Viburnum lobophyllum.** (*Pl. Wils.* i. 114; *M. D. G.* 1912, 201.) H. Erect. Leaves oval, up to 4 in. long and 3½ in. broad. Flowers small, yellowish-white, in inflorescences 2–4 in. across. Fruits roundish, shining red. Central China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

*Viburnum ovatifolium. (*Pl. Wils.* i. 113; *M. D. G.* 1912, 201, as *ovalifolium*.) H. A vigorous-growing shrub. Leaves elongate-ovate, up to 5 in. long and 2 in. broad. Flowers whitish. Fruits shining red, ovoid. Central China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

Vuylstekeara Hyeana. (*O. R.* 1912, 171.) Orchidaceae. G. Garden hybrid between *Odontonia Lairesseae* and *Cochlioda Noetzliana*. (J. Hye de Crom, Ghent.)

Vuylstekeara insignis. (*O. R.* 1911, 60; 1912, 171; *R. H.* 1911, 146.) G. Garden hybrid between *Miltonia vexillaria* and *Cochlioda Noetzliana* (not *Odontioda Vuylstekeae*). (Ch. Vuylsteke, Ghent.) [= *Miltonioda Harwoodii*.]

*Wahlenbergia gentianoides. (*G. C.* 1912, li. 380; *G. M.* 1912, 445.) Campanulaceae. H. A pretty herbaceous perennial with relatively large blue pendulous flowers on slender erect stems 9–12 in. high. (J. J. Piper & Co.) [= *W. vincaeflora*, Decne.]

Weigela styriaca. See **Diervilla hybrida styriaca.**

*Xanthosoma cordifolium. (*K. B.* 1912, 345.) Araceae. S. Allied to *X. sagittaefolium* from which it differs in having very obtusely rounded-cordate leaves and a spadix bearing club-shaped neutral organs. British Guiana. (Kew.)

Xylobium bractescens. (*O. R.* 1912, 359.) Orchidaceae. G. One of the largest species of the genus. Scape $2\frac{1}{4}$ ft. high, with a raceme of about 18 flowers. Bracts narrow, $1\frac{1}{2}$–2 in. long. Sepals and petals rather more than 1 in. long, greenish-yellow. Lip obscurely 3-lobed, with 7–9 strongly undulate fleshy reddish-brown keels. A re-introduction; it was in cultivation in 1842. Peru. (F. Sander & Sons. [Syn. *Maxillaria bractescens*, Lindl.]

Xylosma racemosum var. **pubescens.** (*Pl. Wils.* i. 283; *M. D. G.* 1912, 201.) Bixaceae. H. Evergreen tree, up to 65 ft. high, with long spiny branches. Leaves ovate, serrate, reddish when young, yellowish-grey when old. Fruits black. The variety differs from the type in having the youngest branchlets pubescent. Central and Western China. (Arnold Arboretum; H. A. Hesse, Weener, Hanover.)

Zygopetalum Armstrongiae. (*G. C.* 1912, li. suppl. xxi; *O. R.* 1912, 195.) Orchidaceae. G. Garden hybrid between *Z. Mackaii* and *Z. rostratum*. (Armstrong & Brown.)

Zygopetalum Brewii. (*G. C.* 1912, lii. 56; *J. of H.* 1912, lxv. 279, f.) G. Garden hybrid between *Z. Perrenoudii* and *Z. rostratum*. (Charlesworth & Co.)

Zygopetalum Mackaii Charlesworthii. (*G. C.* 1912, li. 83, f. 37; *O. R.* 1912, 72.) G. Sepals and petals pale emerald green, destitute of the purple-brown marking of the type. Lip pure white. (Charlesworth & Co.)

Zygopetalum maxillare Sanderianum. (*G. C.* 1912, lii. 254; *G. M.* 1912, 753.) G. Flowers large. Sepals and petals pale green, barred with light purple. Lip broad. white. with a thick ribbed violet crest. Probably a fine form of *Z. Sanderianum*. (Sir Trevor Lawrence.)

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1913.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX IV.—1913.

LIST of STAFFS of the ROYAL BOTANIC GARDENS, Kew, and of Botanical Departments, Establishments and Officers at Home, and in India and the Colonies, in Correspondence with Kew.

* Trained at Kew. † Recommended by Kew.

Royal Botanic Gardens, Kew.—

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Assistant, Second Class - -	*John Aikman.
" " " - -	*William Nicholls Winn.

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Assistant Keeper, Jodrell Laboratory.	Leonard Alfred Boodle, F.L.S.

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Arboretum - - - - -	*Arthur Osborn.
Greenhouse and Ornamental Department.	*John Coutts.
Tropical Department - -	*Charles P. Raffill.
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Assistant to Regius Keeper.	W. W. Smith, M.A.
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AFRICA.

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	Chief of Economic Plant Division.	*Henry Powell.
	Conservator of Forests	E. Battiscombe.

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	Conservator of Forests	J. S. Lister, I.S.O.
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	Superintendent	*G. H. Ridley.

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Assistant Superintendent.	R. Nicol.
,, ,,	K. T. Rae.
,, ,,	R. C. Andrew.
,, ,,	T. Thornton.
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	Assistant Agriculturist.	A. P. Cliffe.
	Chief Forest Officer -	*J. M. Purves.

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Botanist - - -	E. J. MacMillan.
Chief of Forestry Division.	K. A. Carlson.

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Salisbury.—Department of Agriculture :—

Director - - -	E. A. Nobbs, Ph.D., B.Sc.
Agriculturist and Botanist.	H. G. Mundy, F.L.S.

Sierra Leone.—Agricultural Department :—

Director of Agriculture.	W. Hopkins.
Assistant Director -	D. W. Scotland.
,, ,,	R. H. Bunting.
Conservator of Forests	C. E. Lane-Poole.

Soudan.—

Khartoum -	Director of Woods and Forests.	——
	Superintendent of Palace Gardens.	*F. S. Sillitoe.
Jebelin - -	Superintendent of Experimental Plantations.	*T. Cartwright.

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	Assistant Director -	A. H. Kirby, B.A.
	Mycologist - - -	†C. O. Farquharson, M.A.
	Superintendent of Agriculture.	S. V. Henderson.
	" "	*F. Evans, F.L.S.
	Assistant Superintendent.	*R. Gill.
	" "	A. J. Findlay, M.A., B.Sc.
	" "	H. G. Burr, B.Sc.
	" "	E. R. Owen.
	Curator - - -	*A. B. Culham.
	Conservator of Forests - -	H. N. Thompson.

Transvaal.—Department of Agriculture :—

Pretoria - -	Botanist - - -	——
	Mycologist - -	†I. B. Pole Evans, B.Sc., F.L.S.
	Conservator of Forests -	C. E. Legat.
Transvaal Museum :—		
	Superintendent of Herbarium . - -	Mrs. R. Pott.

Uganda.—

Kampala—Agricultural Department :—

	Director of Agriculture.	S. Simpson.
	Botanist - - -	W. Small, M.A., B.Sc.
	District Agricultural Officer.	E. T. Druce.
	" "	A. R. Morgan.
	" "	L. Hewett.
	" "	R. G. Harper.
	" "	*T. D. Maitland.
	Assistant - - -	*J. D. Snowden.

Entebbe—Botanical, Forestry and Scientific Department :—

	Chief Forestry Officer	W. R. Rutter.
	Assistant - - -	*Robert Fyffe.
	" - - -	S. H. Carr.
	" - - -	W. Howells.
Zanzibar - -	Director of Agriculture.	F. C. McClellan, F.L.S.

AUSTRALIA.

New South Wales.—Botanic Gardens :—

Sydney - -	Director and Government Botanist.	J. H. Maiden, F.L.S
	Superintendent -	George Harwood.
	Botanical Assistant -	E. Betche.
University Professor of Botany -		A. Anstruther Lawson, D.Sc., Ph.D., F.L.S.
Technological Museum :—		
	Curator - - -	R. T. Baker, F.L.S.
Director of Forests - - -		R. D. Hay.

Queensland.—

Brisbane	Colonial Botanist	-	F. M. Bailey, C.M.G., F.L.S.
Botanic Gardens :—			
	Director	-	J. F. Bailey.
Acclimatisation Society's Gardens :—			
	Secretary and Manager		W. Soutter.
	Overseer	-	James Mitchell.
Forest Department :—			
	Director	-	N. W. Jolly, B.Sc.
Cairns.—Instructor in Tropical Agriculture.			Howard Newport.
Kamerunga State Nursery :—			
	Manager	-	C. E. Wood.
Rockhampton	Superintendent	-	R. Simmons.

South Australia.—

Adelaide.—University Professor of Botany.			T. G. B. Osborn, M.Sc.
Botanic Gardens :—			
	Director	-	Maurice Holtze, Ph.D., F.L.S.
Port Darwin	Curator	-	——
Woods and Forests :—			
	Conservator	-	Walter Gill, F.L.S.

Tasmania.—

Hobart	Government Botanist	-	Leonard Rodway
	Chief Forests Officer	-	J. C. Penny.
Botanic Gardens :—			
	Officer-in-charge	-	Robert Hall.

Victoria.—Botanic Gardens :—

Melbourne	Curator	-	J. Cronin.
National Herbarium :—			
	Government Botanist and University Professor of Botany.		A. J. Ewart, D.Sc., Ph.D., F.L.S.
Conservator of Forests		-	H. R. Mackay.

BERMUDA.

Agricultural Department :—		
Director	-	E. J. Wortley.

CANADA.

Ottawa - -	Director of Government Experimental Farms.	J. H. Grisdale.
	Dominion Horticulturist and Curator of Botanic Garden.	W. T. Macoun.
	Dominion Botanist -	H. T. Güssow.
	Assistant - - -	J. W. Eastham, B.Sc.
	„ - - -	F. Fyles, B.A.

CEYLON.

Peradeniya.—Department of Agriculture :—

Director of Agriculture - - -	R. N. Lyne, F.L.S.
Botanist and Mycologist- - -	†T. Petch, B.A., B.Sc.
Assistant Botanist and Mycologist -	†G. Bryce, M.A., B.Sc.
Superintendent of Experiments -	——
Superintendent of Horticulture -	*H. F. Macmillan, F.L.S.
Curator of Royal Botanic Gardens, Peradeniya.	——
Curator, Hakgala Gardens - -	*J. J. Nock.
Conservator of Forests - - -	T. J. Campbell.

CYPRUS.

Principal Forest Officer - -	A. K. Bovill.
Inspector of Agriculture -	J. Foumis.
Assistant Director - - -	W. Bevan.

FALKLAND ISLANDS.

Government House Garden :—

Head Gardener - - - - - *A. W. Benton.

FIJI.

Superintendent of Agriculture - - Charles H. Knowles.

Botanic Station :—

Curator - - - - - - *Daniel Yeoward.

HONG KONG.

Botanic and Forestry Department :—

Superintendent - - - -	*W. J. Tutcher, F.L.S.
Assistant Superintendent - - . -	*H. Green.

MALTA.

Inspector of Agriculture - - -	Francesco Debono, M.D.	
Superintendent of Public Gardens -	J. Borg, M.D.	

MAURITIUS.

Pamplemousses.—Department of Agriculture :—

Director - - - - -	F. A. Stockdale, M.A., F.L.S.

Department of Forests and Botanic Gardens :—

Director - - - - -	Paul Koenig.
Assistant Director - - -	P. de Sornay.
1st Assistant - - - -	S. E. Pougnet.
2nd „ - - - -	F. Bijoux.
Reduit - - Overseer - - -	W. A. Kennedy.
Forest Officer - - - - -	F. Gleadow.

NEW ZEALAND.

Wellington.—Department of Agriculture :—

Biologist - - - -	T. W. Kirk.

State Forest Department :—

Chief Forester - - -	Henry John Matthews

Colonial Botanic Garden :—

Head Gardener - - -	——
Dunedin - - Superintendent -	- *D. Tannock.
Napier - - „ -	- W. Barton.
Invercargill - Head Gardener -	- ——
Auckland - Ranger - -	- William Goldie.
Christchurch - Head Gardener -	- *Ambrose Taylor.

SEYCHELLES.

Botanic Station :—

Curator - - - - -	P. R. Dupont, F.L.S.

STRAITS SETTLEMENTS.

Straits Settlements.—Botanic Gardens :—

Singapore -	Director - - -	†I. H. Burkill, M.A F.L.S.
	Assistant Superintendent.	*R. Derry.
	„ „	*J. W. Anderson.

Federated Malay States.—Forest Department :—

	Conservator - -	A. M. Burn-Murdoch.

Kuala Lumpur.—Agricultural Department :—

Director of Agriculture.	†L. Lewton-Brain, B.A., F.L.S.
Chief Agricultural Inspector.	†F. W. South, B.A.
Agriculturist - -	†F. G. Spring.
Mycologist - -	F. T. Brooks, M.A.
Assistant Mycologist -	†E. Bateson.
" "	†A. Sharples.
Economic Botanist -	†G. E. Coombs, B.Sc.
Assistant Superintendent Government Plantations.	*J. N. Milsum.

Perak (Taiping).—Government Gardens and Plantations :—

Superintendent - -	*W. L. Wood.

Selangor and Negri Sembilan.—

Assistant Superintendent.	*J. Lambourne.

WEST INDIES.

Imperial Department of Agriculture :—

Barbados - -	Commissioner - -	Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S.
	Scientific Assistant -	W. R. Dunlop.
	Mycologist and Agricultural Lecturer.	W. Nowell.

Antigua.—Government Chemist and Superintendent of Agriculture, Leeward Islands. — H. A. Tempany, B.Sc., F.I.C., F.C.S.

Botanic Station :—

Curator - - -	*T. Jackson.
Agricultural Assistant	C. A. Gomes.
" "	S. V. Athill.

Barbados.—Department of Agriculture.

Superintendent -	John R. Bovell, I.S.O., F.L.S., F.C.S.
Assistant Superintendent.	I. S. Dash.

Dominica.—Botanic Station :—

Curator - -	*Joseph Jones.
Assistant Curator -	G. A. Jones.

Grenada.—Botanic Garden :—

Agricultural Superintendent.	G. G. Auchinleck, B.Sc.
Agricultural Instructor	G. F. Branch.

Montserrat.—Botanic Station :—

Curator - - -	*W. Robson.

St. Kitts-Nevis.—Botanic Station :—

Agricultural Superintendent.	F. R. Shepherd.
Agricultural Instructor, Nevis.	W. I. Howell.

St. Lucia.—Botanic Station :—

Agricultural Superintendent.	*John Chisnall Moore.
Assistant Superintendent.	*A. J. Brooks.

St. Vincent.—Botanic Station :—

Agricultural Superintendent.	*W. N. Sands, F.L.S.
Assistant Agricultural Superintendent.	*F. Birkinshaw.

Virgin Islands.—Botanic Station :—

Curator	*W. C. Fishlock.

Bahamas.—Botanic Station :—

Curator - - -	W. M. Cunningham.

British Guiana.—Department of Science and Agriculture :—

Georgetown -	Director - - -	Prof. J. B. Harrison, C.M.G., M.A., F.I.C., F.C.S.
	Assistant Director and Government Botanist.	†C. K. Bancroft, M.A., F.L.S.
	Forestry Officer -	C. W. Anderson, I.S.O.
	Head Gardener -	†John F. Waby, F.L.S.
	Assistant Gardener -	F. Greeves.
	Agricultural Superintendent.	*Robert Ward.

British Honduras.—Botanic Station :—

Curator - - -	Eugene Campbell.

Jamaica.—Department of Agriculture :—

Director - - -	Hon. H. H. Cousins, M.A., F.C.S.
Travelling Instructor	*William Cradwick.
" "	James Briscoe.

Public Gardens and Plantations :—

Superintendent -	*William Harris, F.L.S.
Superintendent of King's House Gardens.	*William J. Thompson.
Superintendent of Experiment Station.	P. W. Murray.

Tobago.—Botanic Station :—

Curator - - - - - *W. E. Broadway.

Trinidad.—Department of Agriculture :—

Director - - -	Prof. P. Carmody, F.I.C., F.C.S.
Assistant Director and Government Botanist.	W. G. Freeman, B.Sc., F.L.S.
Curator, Royal Botanic Gardens.	J. C. Augustus.
Mycologist - -	J. B. Rorer, M.A.
Forest Officer - - -	C. S. Rogers.

INDIA.

Botanical Survey of India :—

Director - - - - -	Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Economic Botanist - - -	†H. G. Carter, M.B., Ch.B.
Assistant for Phanerogamic Botany	S. C. Banerji, M.A., B.Sc.
„ „ „	M. S. Ramaswami, M.A.

Departments of Agriculture, Botanical Officers attached to :—

Imperial Agricultural Research Institute, Pusa, Bengal :—

Mycologist - - - -	†E. J. Butler, M.B., F.L.S.
Economic Botanist - -	A. Howard, M.A., F.L.S.
Supernumerary Botanist -	——

Bengal Agricultural Department, Calcutta :—

Economic Botanist - -	E. J. Woodhouse, B.A., F.L.S.

Bombay Agricultural Department, Poona :—

Economic Botanist - -	†W. Burns, B.Sc.

Central Provinces Agricultural Department, Nagpur :—

Economic Botanist - -	†R. J. D. Graham, M.A., B.Sc.

Madras Agricultural Department :—

Government Sugarcane Expert, Agricultural College, Coimbatore.	†C. A. Barber, M.A., Sc.D., F.L.S.
Lecturing Botanist - -	K. Rangachari, M.A.
Mycologist - - - -	†W. McRae, M.A., B.Sc.

Departments of Agriculture, Botanical Officers attached to—*continued.*

Punjab Agricultural Department, Lyallpur :—

Economic Botanist - - †D. Milne, B.Sc.

United Provinces Agricultural Department, Cawnpur :—

Economic Botanist - - †H. M. Leake, M.A., F.L.S.

Eastern Bengal and Assam Agricultural Department :—

Economic Botanist - - P. G. Hector, B.Sc.

BENGAL.

Calcutta.—Royal Botanic Garden, Sibpur :—

Superintendent - - - - Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Curator of Herbarium - - - †C. C. Calder, B.Sc., F.L.S.
Curator of Garden - - - *G. T. Lane.
Overseer - - - - - A. G. Laurence.
Probationer - - - - - *W. V. North.
" - - - - - *L. F. Ruse.
" - - - - - *P. V. Osborne.

Gardens in Calcutta :—

Assistant Curator - - - - *J. T. Johnson.
Overseer - - - - - S. N. Bose.

Agri-Horticultural Society of India :—

Secretary - - - - - F. Abbott.
Asst. Secretary and Superintendent S. P. Lancaster.

Darjeeling.—Lloyd Botanic Garden :—

Superintendent - - - - Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Curator - - - - - - *G. H. Cave.

Cinchona Department.—

Superintendent of Cinchona Cultivation. Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.

Mungpoo Plantation :—

Manager - - - - - *P. T. Russell.
Overseer - - - - - W. Cousins.
" - - - - - ——

Munsong Plantation :—

Manager - - - - - *H. F. Green.
Assistant Manager - - - - *H. Thomas.
Overseer - - - - - G. Holl.

BOMBAY.

Bombay City.—Municipal Garden :—

Superintendent - - - - C. D. Mahaluxmivala

Ghorpuri.—Botanic Garden :—

Superintendent - - - - P. G. Kanetkar.

Poona.—Government Gardens :—

Superintendent - - - - *E. Little.

CENTRAL PROVINCES.

Nagpur.—Public Gardens :—

Superintendent - - - - *J. E. Leslie.

MADRAS.

Madras City.—Agri-Horticultural Society :—

Hon. Secretary - - - - L. E. Kirwan.
Superintendent - - - - H. E. Houghton, F.L.S.

Ootacamund.—Government Gardens and Parks :—

Curator - - - - - *F. H. Butcher.

Cinchona Department.—

Director of Cinchona Plantations - W. M. Standen.
Superintendent, Dodabetta Plantation. - H. V. Ryan.
Superintendent, Nedivattam and Hooker Plantations. - E. Collins.

PUNJAB.

Delhi.—Government Horticultural Department :—

Officer in Charge - - - - *A. E. P. Griessen.

Historic and other Gardens :—

Superintendent - - - - *R. H. Locke.

Lahore.—Government Gardens :—

Superintendent - - - - *A. Hardie.

Agri-Horticultural Gardens :—

Superintendent - - - - *W. R. Mustoe.

Simla.—Vice-regal Estate Gardens :—

Superintendent - - - *Ernest Long.

NORTH-WEST FRONTIER PROVINCE.

Agri-Horticulturist - - - *W. R. Brown.

UNITED PROVINCES OF AGRA AND OUDH.

Agra.—Taj and other Gardens :—
Superintendent - - - - ——

Allahabad.—Government Gardens :—
Superintendent - - - - *W. Head.

Cawnpur.—Memorial and other Gardens :—
Superintendent - - - - *R. Badgery.

Kumaon.—Government Gardens :—
Superintendent - - - - *Norman Gill, F.L.S.

Lucknow.—Horticultural Gardens :—
Superintendent - - - - *H. J. Davies.
Probationer - - - - *E. E. Mawer.

Saharanpur.—Government Botanic Gardens :—
Superintendent - - - - *A. C. Hartless.

Dehra Dun.—Imperial Forest Research Institute :—
Imperial Forest Botanist - - R. S. Hole, F.L.S.

EASTERN BENGAL AND ASSAM.

Dacca (Ramna).—Arboricultural Expert. *R. L. Proudlock.

NATIVE STATES.

Mysore (Bangalore) :—
Economic Botanist - - - *G. H. Krumbiegel.

Baroda :—
Superintendent - - - - T. R. Kothawala.

Travancore (Trivandrum) :—
Director - - - - - Major F. W. Dawson.

Udaipur :—
Superintendent - - - - T. H. Storey.